"ONE YEAR PROSPECTIVE STUDY ON ACCURACY OF DIAGNOSTIC PERITONEAL PARACENTESIS IN ACUTE ABDOMEN REQUIRING EMERGENCY SURGICAL INTERVENTION"

A DISSERTATION SUBMITTED TO THE TAMILNADU
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In partial fulfilment of the Regulations

for the award of the Degree of

M.S. (GENERAL SURGERY)

DEPARTMENT OF GENERAL SURGERY

TIRUNELVELI MEDICAL COLLEGE

TIRUNELVELI

APRIL 2016

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ABSTRACT

TITLE

"**One year prospective study on accuracy of diagnostic peritoneal paracentesis in acute abdominal condition requiring emergency surgical intervention."**

OBJECTIVE:

Acute Abdomen is common in surgical practice. Most of the cases of acute abdomen can be diagnosed clinically in presence of abdominal pain, abdominal tenderness, guarding and rigidity. There should be certain diagnostic modality, which confirms the diagnosis and the surgeon should feel safe and accurate in deciding which patient, requires surgical intervention. Although imaging modalities like Xray, USG, CT, MRI etc.available and can diagnose near accurately, these investigations are not available everywhere or not available for 24 hours in developing countries like India. Therefore we need a diagnostic modality, which is simple, near accurate and easily available by the bedside.

Abdominal Paracentesis is a simple bedside procedure, which is quite accurate in diagnosing acute abdominal conditions and helps in decision making whether surgical intervention needed or not.

The present study will be undertaken to know the accuracy of Abdominal Paracentesis in surgical acute abdomen.

MATERIALS AND METHODS:

Fifty patients were examined by abdominal tap who presented as acute abdominal emergencies including postoperative and traumatic cases. The standard technique followed throughout this series was a four quadrant tap. A 10 ml syringe fitted with a 20 guage intravenous needle was used. Results were indicated as positive when > 0.5ml fluid or peritoneal aspirate was obviously pathological. Negative/dry tap, when no fluid is

aspirated from all four quadrant. The aspirated peritoneal fluid was analysed both macroscopically in terms of nature, colour and odour of the fluid and microscopically for total WBC and RBC count. Microscopic findings of WBC > 500 cells/cu.mm or/and RBC >1 lakh cells/cu.mm was obviously pathological and considered as positive tap. WBC < 100cells/cu.mm or/and RBC <50,000Cells/cu.mm considered as negative tap and managed non operatively depending upon circumstances.

INCLUSION CRITERIA :

All patients aged above 12 years, with acute abdominal pain, both traumatic and non-traumatic conditions who require emergency surgical intervention will be included.

EXCLUSION CRITERIA :

All patients with the following diagnosis will be exclude from the study.

1. All pregnant patients.
2. All patients suspected of acute intestinal obstruction.
3. All patients with acute gastritis, acute non perforative biliary tract diseases, acute appendicitis.
4. All patients with renal or ureteric calculi.
5. All patients with extensive abdominal scar.

RESULTS:

46 out of 50 cases tap was positive. Of these, 45 taps were true positive and were subjected to laparotomy and findings confirmed, in 1 case tap was found to be false fositive, which we managed conservatively. Of 4 negative/dry taps, 1 is true negative and 4 were false negative. The overall diagnostic accuracy in our study was 93.75%. In blunt trauma abdomen diagnostic accuracy was 100%, whereas in non-traumatic acute surgical abdomen, diagnostic accuracy was 91.42%.

CONCLUSION:

Abdominal paracentesis is a safe, accurate and reliable diagnostic procedure very useful in acute abdominal condition.

KEY WORDS

Laparotomy, abdominal paracentesis, acute abdomen, blunt trauma abdomen.

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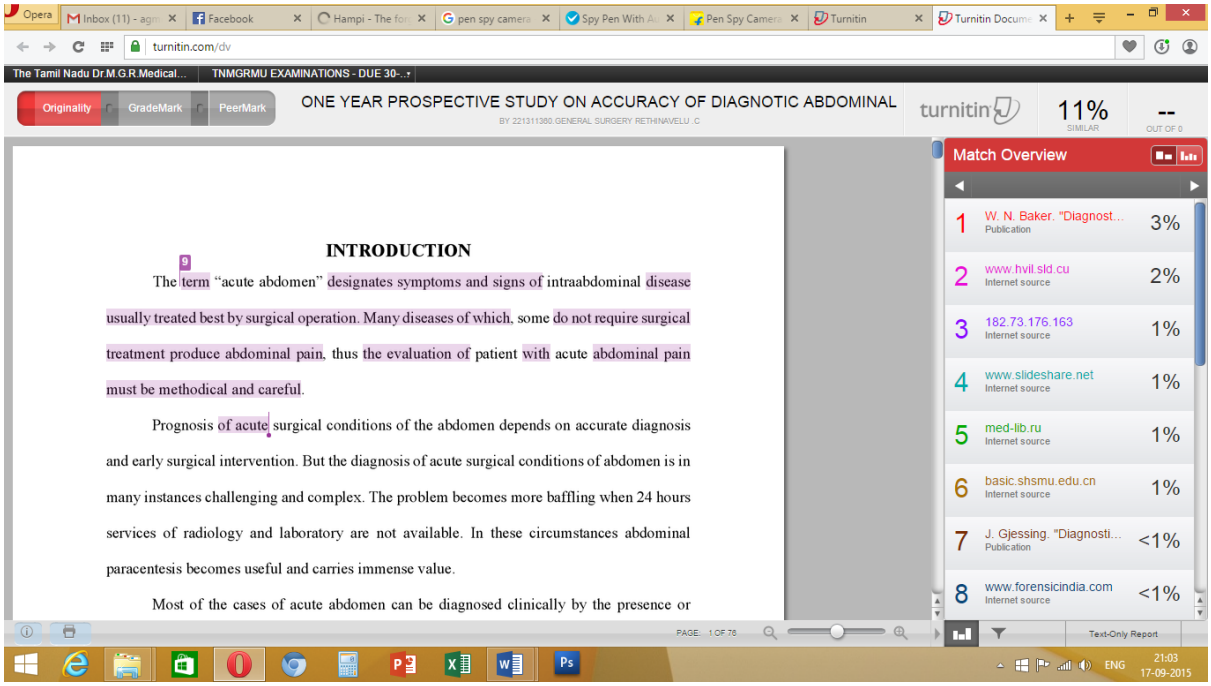
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INTRODUCTION
The term "acute abdomen" designates symptoms and signs of intraabdominal disease usually treated best by surgical operation. Many diseases of which, some do not require surgical treatment produce abdominal pain, thus the evaluation of patient with acute abdominal pain must be methodical and careful.
Prognosis of acute surgical conditions of the abdomen depends on accurate diagnosis and early surgical intervention. But the diagnosis of acute surgical conditions of abdomen is in many instances challenging and complex. The problem becomes more baffling when 24 hours services of radiology and laboratory are not available. In these circumstances abdominal paracentesis becomes useful and carries immense value.
Most of the cases of acute abdomen can be diagnosed clinically by the presence or
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PRINCIPAL INVESTIGATOR: DR.C.RETHINAVELU, MBBS.,

DESIGNATION OF PRINCIPAL INVESTIGATOR POST GRADUATE IN GENERAL SURGERY
DEPARTMENT & INSTITUTION: TIRUNELVELI MEDICAL COLLEGE , TIRUNELVELI

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THE FOLLOWING DOCUMENTS WERE REVIEWED AND APPROVED

1. TIREC Application Form ☐
2. Study Protocol ☐
3. Department Research Committee Approval ☐
4. Patient Information Document and Consent Form in English and Vernacular Language ☐
5. Investigator's Brochure ☐
6. Proposed Methods for Patient Accrual Proposed ☐
7. Curriculum Vitae of the Principal Investigator ☐
8. Insurance /Compensation Policy ☐
9. Investigator's Agreement with Sponsor ☐
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14. Clinical Trials Registry-India (CTRI) Registration ☐

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1. The approval is valid for a period of 2 year/s or duration of project whichever is later
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3. A written request should be submitted 3weeks before for renewal / extension of the validity
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INTRODUCTION

The term “acute abdomen” designates symptoms and signs of intra-abdominal disease usually treated best by surgical operation. Many diseases of which, some do not require surgical treatment produce abdominal pain, thus the evaluation of patient with acute abdominal pain must be methodical and careful.

Prognosis of acute surgical conditions of the abdomen depends on accurate diagnosis and early surgical intervention. But the diagnosis of acute surgical conditions of abdomen is in many instances challenging and complex. The problem becomes more baffling when 24 hours services of radiology and laboratory are not available. In these circumstances abdominal paracentesis becomes useful and carries immense value.

Most of the cases of acute abdomen can be diagnosed clinically by the presence or absence of abdominal pain, abdominal tenderness, guarding and rigidity. There should be a certain diagnostic modality which confirms the diagnosis and the surgeon should feel safe and accurate in deciding which patients require surgical intervention. Although imaging modalities like X-rays, USG, CT, MRI etc are available and can diagnose accurately, these investigations are not available everywhere or not available for 24 hours, in developing countries like India. For these reasons there should be a diagnostic modality which is simple, accurate and available by the bedside.

Peritoneal paracentesis is a simple, accurate and bedside procedure. This requires an appropriate sized needle attached to a disposable syringe which is available everywhere. The basic principle is that in many cases of acute abdomen, there is collection of fluid in the peritoneal cavity. Aspirating the fluid and analysing it both grossly and microscopically will aid in arriving at the diagnosis.

The objections to the technique, most often raised had been on the grounds of safety. As the procedure is blind, there are chances of puncturing the bowel. But many clinical and

experimental studies have proved beyond doubt that even if bowels are punctured by the needles, subsequent leakage is a very small hazard.

In spite of numerous articles advocating the acceptance of this extremely useful diagnostic tool, some continue to deplore it and others have not had sufficient experience in performing this procedure or do not understand the merits and limitations. The present study was undertaken to know the merits and demerits of peritoneal tapping in surgical acute abdomen.

AIM OF THE STUDY

1. To evaluate the efficacy of abdominal paracentesis as a simple, bedside diagnostic tool in diagnosing the acute abdominal conditions requiring emergency surgical interventions.
2. Correlation of laparotomy with the abdominal paracentesis data to predict its diagnostic accuracy.

REVIEW OF LITERATURE

Though diagnostic paracentesis has been used for a long time, recordings of its use are available only from the last 100 years.

"Solomon was the first person to describe the technique of abdominal paracentesis in 1906". He passed a ureteral catheter through a small trocar into the peritoneal cavity to obtain a sample of peritoneal fluid. He described this procedure as a "useful one".[2]

The first comprehensive study of the technique was carried out by" Neuhof and Cohen in 1926 who reported its use as a diagnostic aid in the evaluation of closed abdominal injuries, acute pancreatitis and primary pneumococcal or streptococcal peritonitis.[3"]

Accuracy of the procedure was investigated experimentally in 1960. Observation in dogs showed that there is a linear relation between the amount of fluid in the peritoneal cavity and probability of obtaining a sample by needle paracentesis. A volume of 500 ml of free fluid in the peritoneal cavity expected to give a 78% positive paracentesisis.[4]

Peritoneal paracentesis is a safe procedure even in cases of intestinal obstruction, where there is a chance of puncturing the bowel. Many clinical studies have shown the safety of abdominal paracentesis in intestinal obstruction.

In 1954 a study was conducted experimentally on dogs, where an isolated loop of segments of intestine was deliberately punctured and subsequently inflated. They found no leakage until a pressure of 260 mmHg was reached, whereas intraluminal pressure seldom rises above 15 to 20 mm of Hg in intestinal obstruction. Therefore the chance of leakage from accidental puncture is very small.[5]

In 1965 a study was conducted to determine the safety of the procedure. The intestinal tract of an anesthetized dog was dilated by a continuous flow of air through an intragastric Levin tube. Twenty needles of 15 and 18 gauge were inserted deeply through the abdominal wall at scattered position over a circular area approximately 6 inches in diameter. When the

abdominal wall was turned down as one large flap, it was seen that none of the needles, despite the depth of their insertion had penetrated the bowel wall.[6]

The same author conducted another study to test the leakage from bowel if punctured accidentally. In a same anaesthetised dog, 5 needles of 15 or 18 gauge were inserted into isolated loop of jejunum. After the needles were removed, the loop was filled with diluted plasma stained with methylene blue. No leakage of plasma occurred through the needle punctures. The usual intraluminal pressures observed in the presence of complete intestinal obstruction are less than 15 mm of Hg for small intestine and 20 mm of Hg for large intestine. No leakage of plasma from the needle puncture in this loop was observed until the intraluminal pressures reached 180mm of Hg, more than ten times the pressure usually present in complete obstruction.[6]

"Popular technique "Four quadrant tap" was first advocated by Byrne in 1956.[7]"

A study conducted in 1967 describes a different technique of peritoneal tap. A polythene catheter was inserted with the aid of a trocar and cannula into the abdominal cavity under local anaesthesia. Before aspiration, the catheter was left in the peritoneal cavity for 2 or 3 minutes and then aspirated.[8]

An article published in 1972 describes an interesting technique of aspirating peritoneal fluid. A trocar and cannula was passed through an incision made 3-5 cms below the umbilicus in the midline under local anaesthesia into the peritoneal cavity. The trocar was then removed and a soft flexible plastic catheter (a dialysis catheter is ideal) was inserted into the peritoneal cavity and gently manipulated into the pouch of Douglas. A small sample of fluid was then aspirated. As the pouch of Douglas is the most dependent part of the peritoneal cavity, a small amount of fluid will collect their first and chances of false negative rates will be decreased.[9]

Peritoneal tap can also be performed over the maximum tender spot.[10] this is particularly useful in some cases where there is localized collection of fluid, like in laceration of spleen where fluid will collect in left paracolic gutter.

Different authors have used different needles and syringes while doing paracentesis. "Strickler J. W. (1958) used a 14 gauge needle through which polythene tubing was threaded into the peritoneal cavity.[11]" "Giacobine J. N. (1960) used an 18-20 gauge needle and employed a gentle suction with a syringe".[4] " Baker W. N. W. (1967) advocated the use of a 12 gauge needle attached to 2-5ml syringe and needle introduced without anaesthesia".[12] "Prout W. C. (1968) had used a needle without a catheter and does not recommend a complicated apparatus as it was not practicable for routine usage.[13]" "Trivedi D. R. et al. (1971) used an 18 gauge needle 5 cm long with 10ml syringe with normal saline to prevent accidental entry of air into the peritoneal cavity.[14]" "McPartlin J. F. (1971) used a needle with a 5 ml syringe under local anaesthesia and aspiration continued till the needle was withdrawn.[10]"

Most of the workers have taken paracentesis as positive when, quantity larger than 0.5 ml of any fluid has been aspirated from the peritoneal cavity or if the fluid is obviously pathological.

Negative paracentesis is the main drawback of the peritoneal paracentesis, quoted in the literature. Though, the positive peritoneal tap indicates intraabdominal pathology, negative tap does not rule out abdominal pathology .Explanation given to this statement was that peritoneal paracentesis is a blind procedure. There are chances of needle tip not entering the fluid level or minimal fluid in the peritoneal cavity or collection of fluid in the pouch of Douglas or localised collection of the fluid, not amenable to needle paracentesis.

No life threatening complication has been reported in the literature. Only a few complications had been encountered. Prout W. C. in 1968 reported three complications; Hematoma of anterior caecal wall and adjacent mesentery, inferior epigastric artery puncture

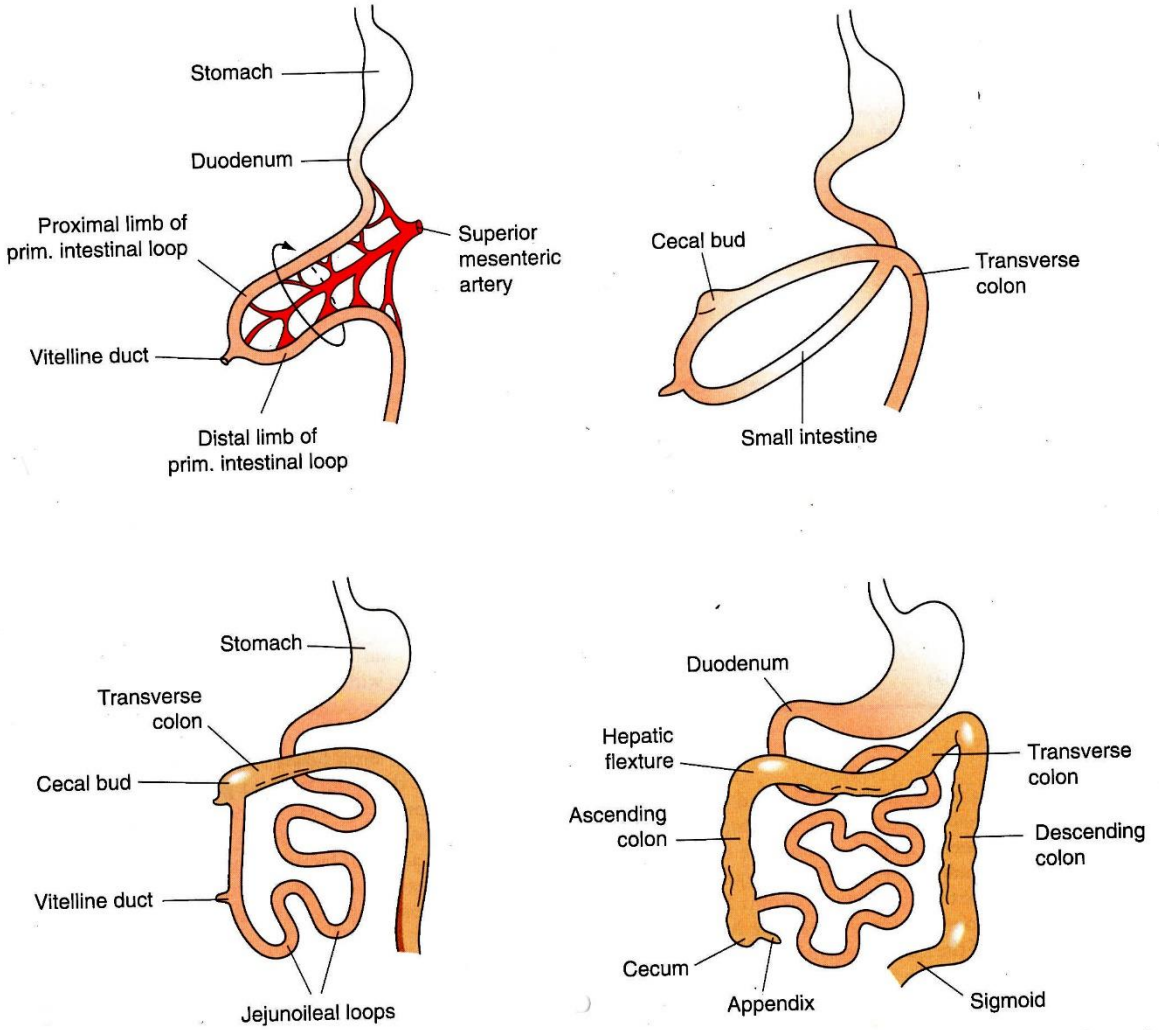
with a small hematoma of the abdominal wall and a punctured iliac vessel.[13] McDonald J. in 1961 encountered a case of hematoma of the rectus sheath.[16] Many authors reported no complications even though bowel was punctured during the procedure. Steinberg B. (1941) reported that intestinal loops are pushed away by the point of the needle and even a deliberate experimental attempt to puncture the bowel was not accomplished.[17] In contrast to the above statement, Siler V. E. (1960) reported that, there is always some degree of trauma to the abdominal viscera and the lumen of intestine is more frequently entered. He mentions that, the gut has the ability to seal the punctures readily with very little contamination of the peritoneal cavity.[4]

ANATOMY AND PHYSIOLOGY OF THE ABDOMINAL CAVITY

EMBRYOLOGIC AND PHYSIOLOGIC CONSIDERATIONS

The embryological development of the abdomen is relevant in two respects. The structures that are developed initially as midline structures, the visceral pain is usually felt along the midline of the abdomen. The structures that are segmental in origin, the pain originating from that segmental structure will corresponds to the same segments.[18]

The developing gastrointestinal tract is divided into three regions based on blood supply and innervation, relationships that are maintained from embryonic to adult life.



DEVELOPMENT OF GUT

The embryonic gut tube is derived from endoderm during fourth week of gestation. The gut tube is divided into foregut, midgut, and hindgut. Other than duodenum, which is a foregut structure, the rest of small intestine is derived from the midgut. The gut tube initially communicates with the yolksac; however, the communication between these two structures narrows by the sixth week to form the vitelline duct.

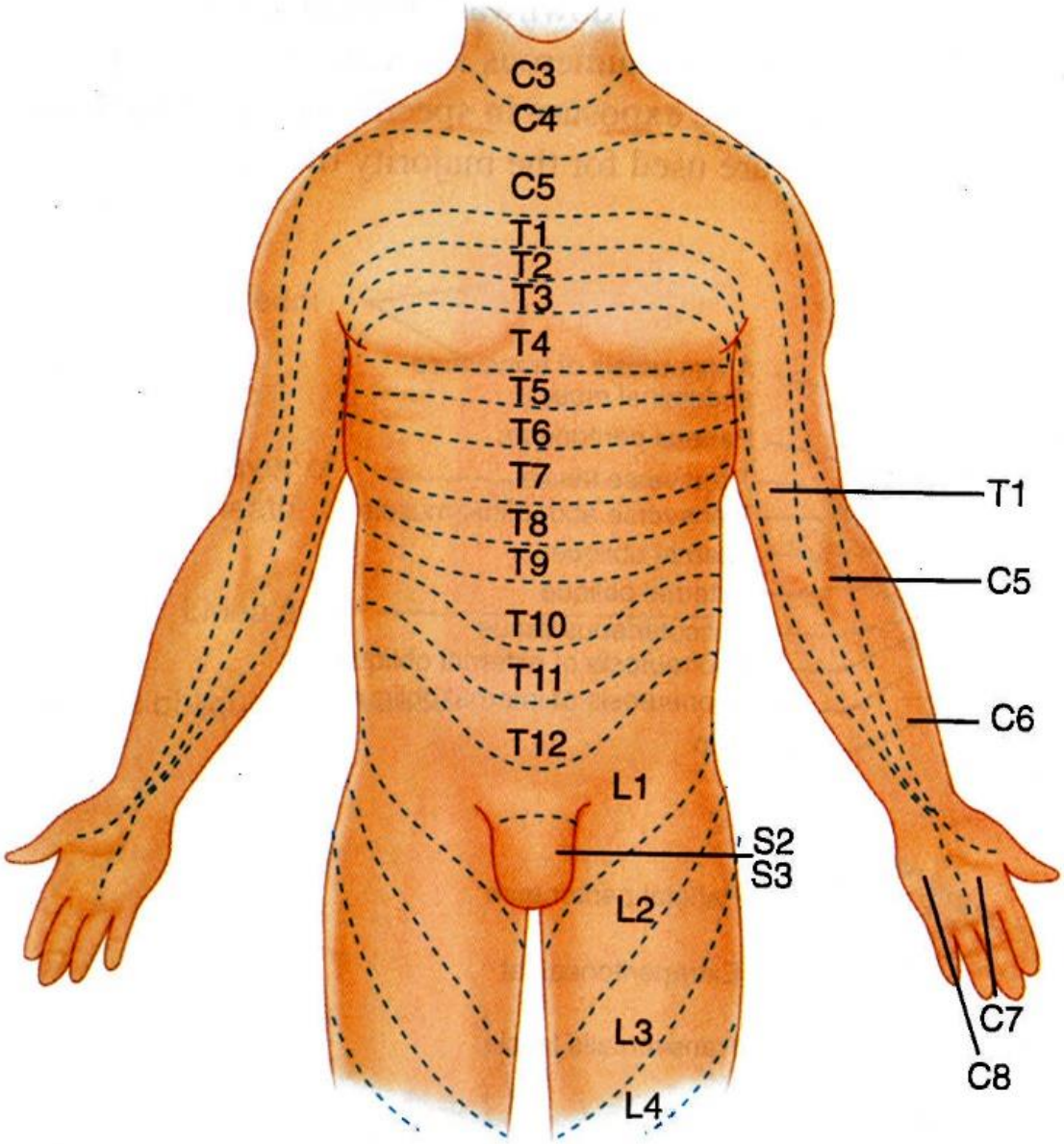
Also during the fourth week of gestation, mesoderm of the embryo splits. The portion of mesoderm that adheres to the endoderm forms the visceral peritoneum, while the portion that adheres to the ectoderm forms parietal peritoneum. This mesodermal division results in the formation of a coelomic cavity that is the precursor of the peritoneal cavity.

During the fifth week of gestation, the developing intestine herniates out of the coelomic cavity and begins to undergo a counterclockwise rotation about the axis of superior mesenteric artery. Intestinal rotation continues, as the developing transverse colon passes anterior to the developing duodenum. Final positions of the small intestine and colon resulting from a 270* counterclockwise rotation of the developing intestine and its return into the abdominal cavity.

Developmental anatomy of G. I. Tract

Regions	Structures Developed
Fore gut	Oropharynx, Oesophagus, Stomach, Proximal Duodenum, Pancreas Liver, Biliary tract and Spleen.
Midgut	Distal Duodenum (ligament of Treitz), Small intestine, Appendix Caecum, ascending Colon and proximal two thirds of transverse Colon.
Hindgut	Remainder of Colon

DERMATOMAL SENSORY INNERVATION OF ANTERIOR ABDOMINAL WALL



Abdominal pain is divided into visceral , somatoparietal and referred components.

Visceral peritoneum is supplied by autonomic innervation, whereas parietal peritoneum is supplied by somatic innervation. This difference accounts for the distinct character of the pain associated with irritation or inflammation.

Somato Parietal pain is more intense, sharp, severe, persistent and more precisely localized than visceral pain, nerve impulses mediating parietal pain travel within the somatosensory spinal nerves and react the spinal cord in the peripheral nerves corresponding to the cutaneous dermatomes from T6 to L1. Lateralization of parietal pain is possible because only one side of the nervous system innervates a given part of the parietal peritoneum.

In contrast, painful stimuli involving the visceral peritoneum is caused by stimulation of visceral nociceptors , is perceived as vague, dull, cramping or aching, poorly localised to the epigastrium, periumblical, or hypogastrium, depending on the embryonic origin of organ involved and are often associated with secondary autonomic effects such as nausea, vomiting, diaphoresis, or both.[19]

Visceral pain is felt in the midline because these organs transmit sympathetic sensory afferents to both sides of the spinal cord. The pain is poorly localized because the innervation of most viscera is multisegmental and contains fewer nerve receptors.

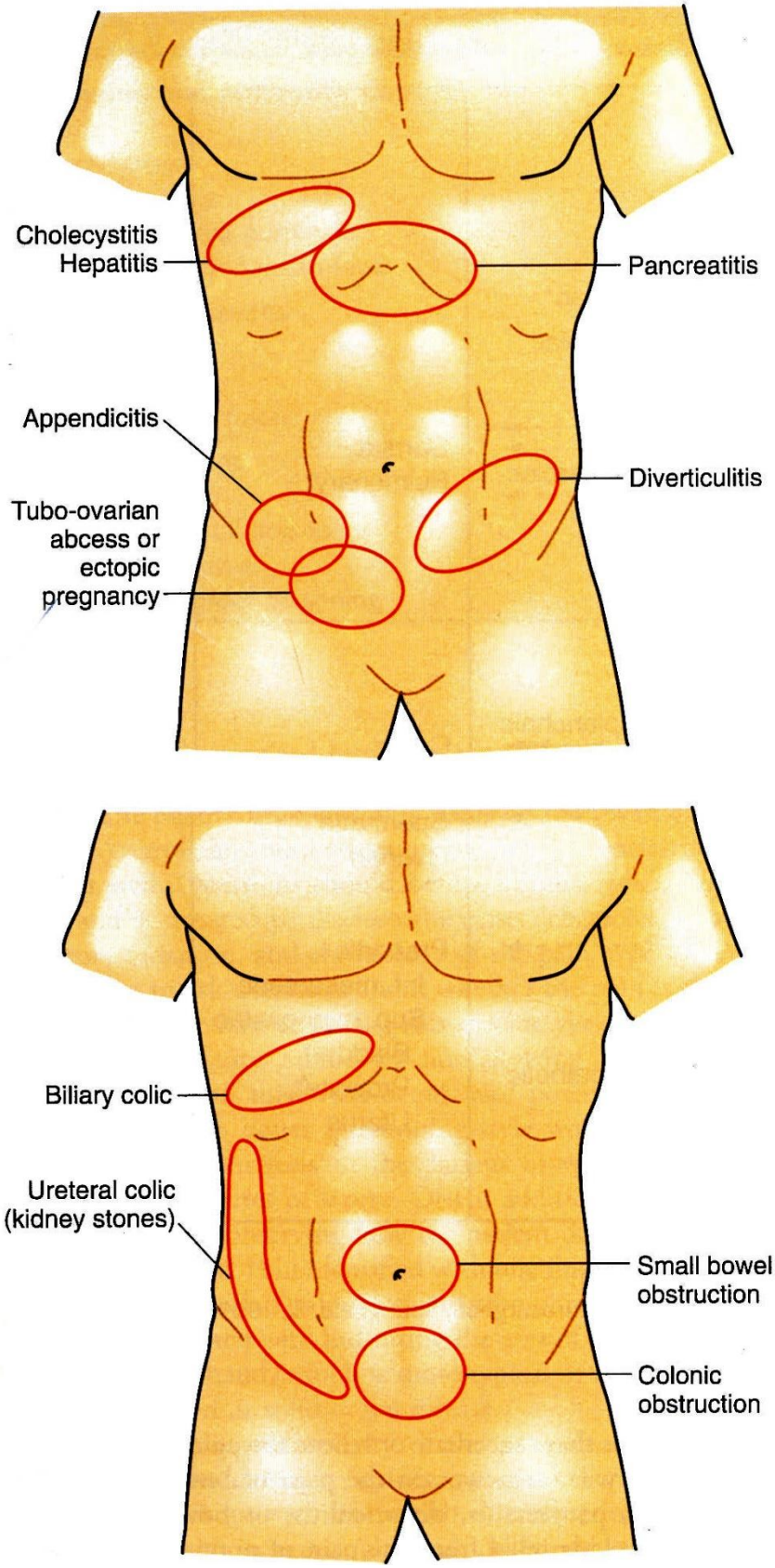
Visceral pain usually indicates the presence of significant intraabdominal diseases but is not in itself an indication for emergency surgical therapy. A transition from visceral to somatic pain implies extension of the underlying disease process to include the parietal peritoneum and often heralds the needs for urgent operative intervention. In this regard, it is important to distinguish between localised somatic pain and diffuse somatic pain. Conditions associated with localised peritonitis may require operation, the degree of urgency is far less than in diffused peritonitis, which generally indicates a surgical emergency.[19]

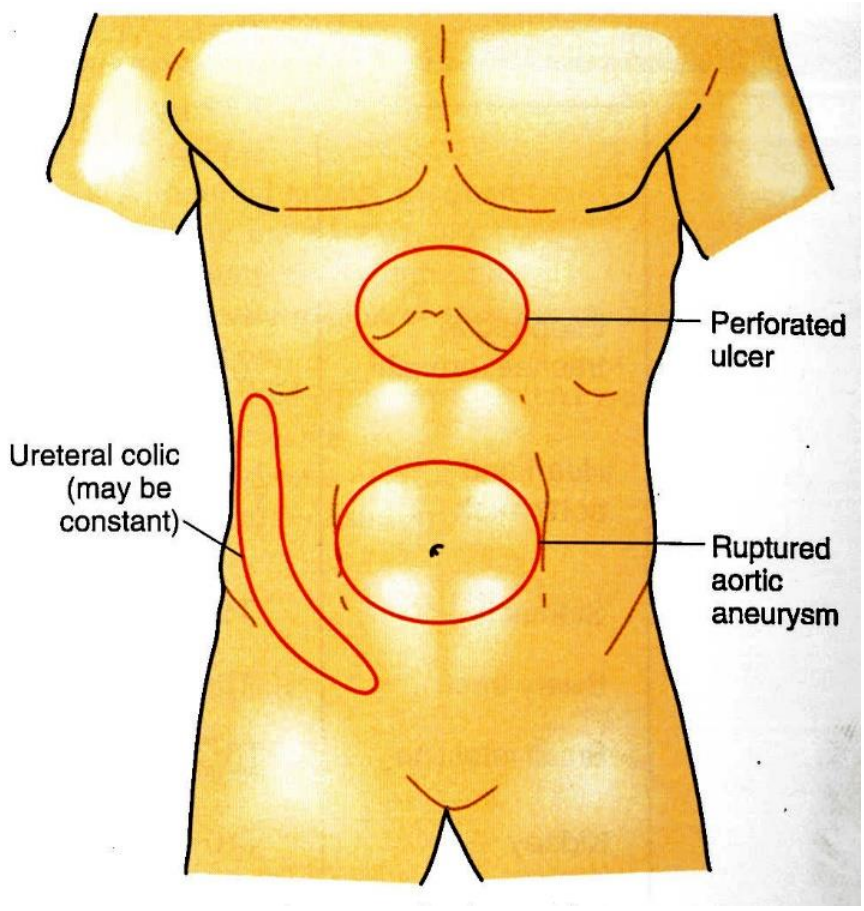
Pain of foregut origin (stomach, duodenum and biliary tree) is usually perceived in the epigastrium, midgut pain (intestine, appendix, right colon) in the periumbilical origin and hind gut pain (left colon and rectum) in the hypogastrium.[19]

A third form of the pain related to acute abdominal disorders is ***referred pain***. It is a pain perceived at a site distant from the source of stimulus. Referred pain is perceived at a site removed from the anatomic location of the disease but in a region that shares a common embryonic origin.[19]

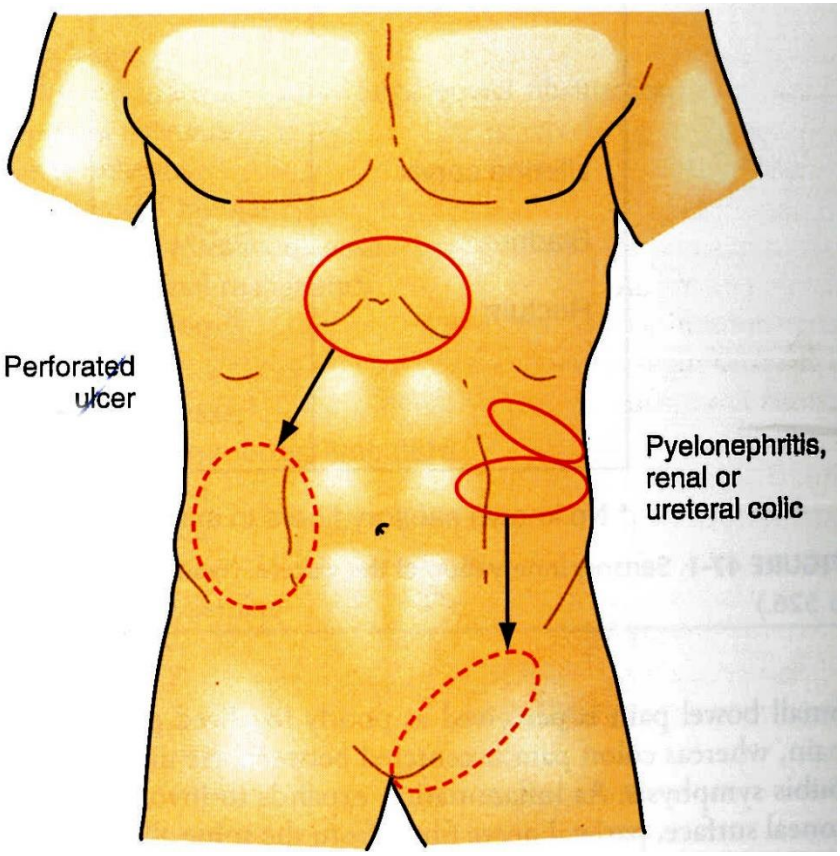
SITES OF REFERRED PAIN	**Organ(s)**	**Common examples**
Right subscapular or shoulder	Diaphragm, Gallbladder, liver	Biliary colic, perforated ulcer, pneumoperitoneum
Left subscapular or shoulder	Diaphragm, Spleen, Stomach, tail of Pancreas, Splenic flexure of Colon	Splenic rupture, Pancreatitis
Back	Pancreas, Duodenum, Aorta	Pancreatitis, ruptured abdominal aortic aneurysm
Coccyx	Uterus, Rectum	Uterine colic
Groin or genitalia	Kidney, Ureter, Iliac arteries	Ureterolithiasis

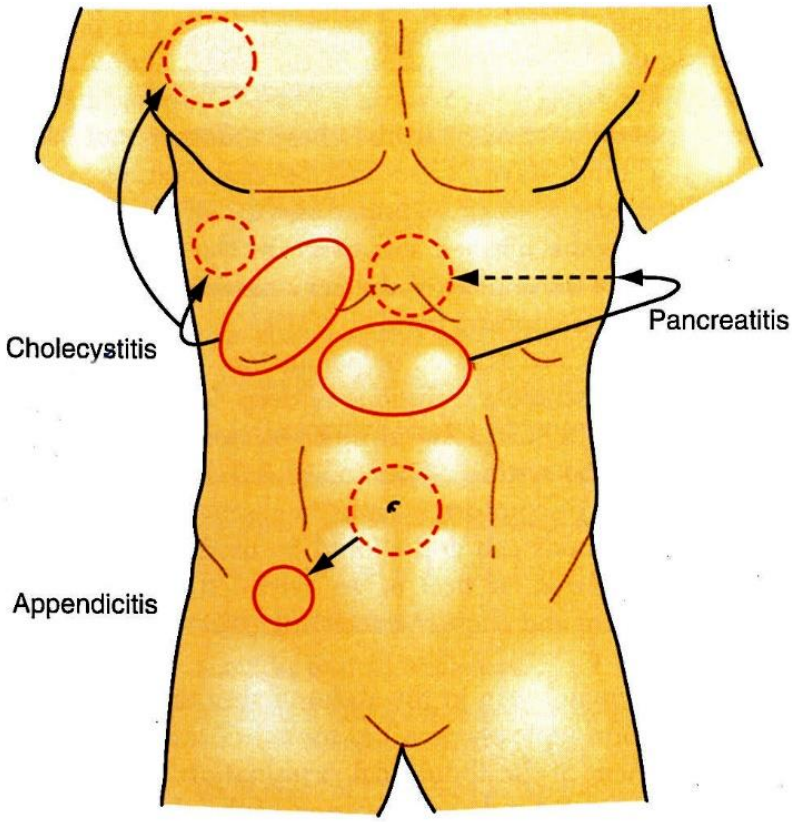
COMMON SITES OF PAIN




Perforated ulcer
Ureteral colic (may be constant)
Ruptured aortic aneurysm

SITES OF REFERRED PAIN

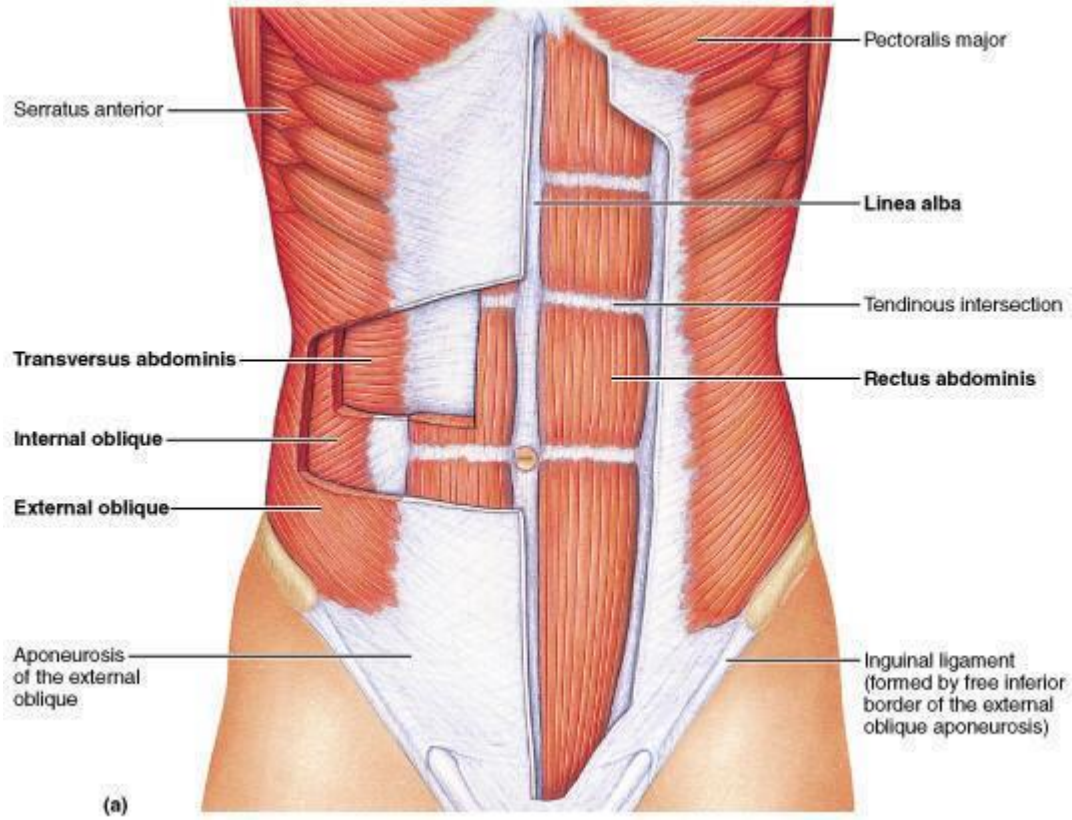




ANATOMY OF ABDOMINAL WALL AND THE PERITONIAL CAVITY

ANATOMY

Abdomen extends from the diaphragm to the base of the pelvis, comprising the abdomen proper and the lesser pelvis.[20]



ABDOMEN PROPER BOUNDED

***In front*:** By the rectus Abdominis, the pyramidalis and aponeurotic parts of the externus, internus and transversus abdominis.

Laterally: Parts of the three flat muscles, the iliacus muscles and iliac bones

Behind: Lumbar vertebral column, psoas major muscle, quadratus lumborum muscle.

Above: Diaphragm

Below: Lesser pelvis

LAYERS OF ANTERIOR ABDOMINAL WALL

Layers of the anterior abdominal wall that are pierced while performing peritoneal tap from outside to inside.

1. Skin
2. Superficial fascia
    a) Fatty layer – Camper
    b) Deep Membranous – Scarpa
3. External oblique – muscle, aponeurosis
4. Internal oblique muscle
5. Transverses abdominis muscle
6. Fascia transversalis
7. Extra peritoneal fatty tissue
8. Peritoneum

ABDOMINAL REGIONS

For the location of viscera in clinical practice, the abdomen is divided into nine regions by imaginary planes, two horizontal and two parasagittal.

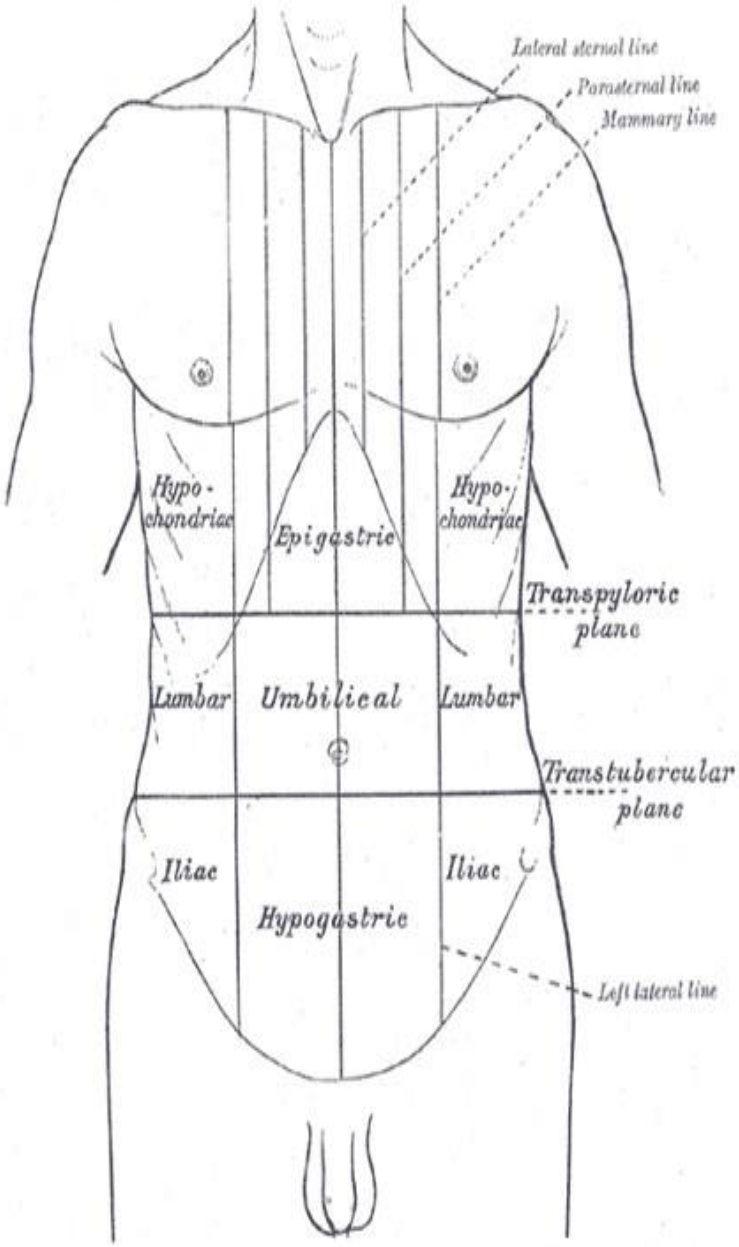
The upper, horizontal transpyloric plane (of Addison) is indicated by a line encircling the body midway between the suprasternal notch and the symphysis pubis or hand's breadth below the xiphisternal joint. It intersects the first lumbar vertebral body near its lower border and meets the coastal margins at the tips of the ninth coastal cartilages.

The lower horizontal, transtubercular plane corresponds to a line round the trunk level with the iliac tubercles, it cuts the front of the fifth lumbar vertebral body near its upper border.

The abdomen is thus divided into three arbitrary zones; each is further subdivided into three by the right and left lateral planes indicated, on the surfaces by vertical lines through points midway between the anterior superior iliac spines and symphysis pubis.[20]

HENCE THERE ARE NINE QUADRANTS

Right hypochondrium, epigasrium, left hypochondrium, Right lumbar, Umblical, Left lumbar, Right iliac, Hypogastrium, and Left iliac regions.



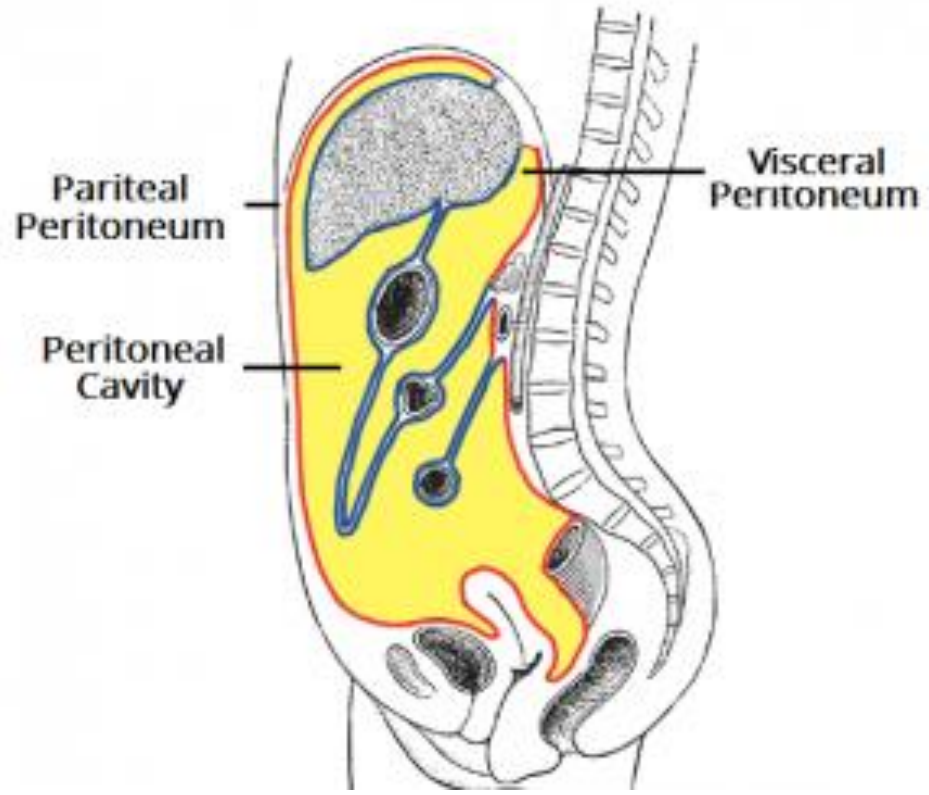
REGIONS OF THE ABDOMEN

PERITONEUM AND PERITONEAL CAVITY

The peritoneum consists of a single sheet of simple squamous epithelium termed mesothelium (mesodermal origin). The peritoneum, largest and most complexly arranged of the serous membranes, is an empty and intricately folded sac, lining the abdomen and reflected over the viscera. In males it is a closed sac: in females the lateral ends of the uterine tubes open into the sac's potential cavity.[21]

It is divided into,

1) ***Parietal peritoneum***
2) ***Visceral peritoneum***



Parietal peritoneum lines the anterior, posterior, lateral abdominal wall surfaces, inferior surface of diaphragm and pelvis and it is reflected over the viscera as the visceral peritoneum, lines intraperitoneal organs. Its free surface is covered by mesothelium. The

mesothelial cells secrete serous fluid which provides a lubricant to allow gliding movements of the viscera. In the normal healthy adult the peritoneal cavity contains < 100 ml of sterile serous fluid.[22]

Overlying the diaphragm, the mesothelial cells assume a unique anatomic and functional arrangement. The usual smooth layer of cells is interrupted by a large number of intercellular gaps called stomata. Stomata are found only on the muscular portion of the diaphragm.[21]

Several factors can influence diaphragmatic uptake of fluid and particles.

1. Mesothelial cells contain the contractile filaments, actin, which when paralysed, markedly enlarges in size.
2. Most important is the state of diaphragmatic contraction. With exhalation, the diaphragm relaxes, the stomata open, and because of the negative pressure induced by the diaphragm moving upward, fluid and particulate material are sucked up to the open stomata and then to the substernal lymph nodes and from their to the thoracic duct.
3. Presence of inflammation, which increases stomata patency by inducing mesothelial cell retraction.

The diaphragmatic lymphatic plays a major role in the absorption of fluid and particulate matter from the peritoneal cavity, both under normal circumstances and during peritonitis. The presence of bacteria and toxins in the peritoneal fluid in peritonitis will be absorbed into the systemic circulation, which helps in spreading the infection.

Thus peritoneum is a bidirectional, semipermeable membrane that maintains the amount of fluid in the peritoneal cavity, promotes the sequestration and removal of bacteria from the peritoneal cavity and facilitates the migration of inflammatory cells from the microvasculature to the peritoneal cavity.

ACUTE ABDOMEN

Acute disease within the abdomen is common in many patients with acute abdominal symptoms present every day to doctors working in the community. Within a Western population of half a million people, between 5 and 10 patients are admitted to a surgical ward each day with acute abdominal pain. One or two more will complain of acute abdominal symptoms after an accident.[18]

Julian Britton defines it as "the illness which starts suddenly and most patients present to a hospital within three or five days of the onset of symptoms".[18]

Jones S. R. describes the term acute abdomen as "symptoms and signs of intra-abdominal disease usually treated best by surgical operation".[23]

When faced with a patient with acute abdominal pain, the admitting surgeon has two options: either to perform exploratory surgery, or to observe for a variable period, perhaps instituting further investigations to help to reveal the diagnosis. In at least 20% of patients, the decision to operate may be uncertain and the surgeon must then make a calculated gamble to either "look and see" or "wait and see" policy.[24]

The most powerful aid to the clinician in reaching a management decision in the acute abdomen is a thorough history and clinical examination is a primary role, with urgent investigations playing a secondary role. It has been recognized for many years that diagnostic accuracy in the acute abdomen is low but can be improved by up to 20% using computer aided diagnosis. This improvement is associated with a corresponding reduction in management errors. The clinical data (history and examination) are collected on a structured profoma and then entered into a computer, which produces a list of diagnostic probabilities.[24]

CAUSES OF ACUTE ABDOMEN

The surgical, intra-abdominal causes of the acute abdomen can be divided into 5 general categories:[23]

1. Hemorrhage
2. Inflammation / infection
3. Perforation
4. Ischemia
5. Obstruction

INTRA-ABDOMINAL CAUSES OF THE ACUTE ABDOMEN

Hemorrhage

- Ruptured aortic aneurysm
- Ruptured visceral aneurysm
- Ruptured tumour
- Ruptured solid organ (spleen, liver)
- Postoperative bleeding
- Ruptured ectopic pregnancy
- Ruptured ovarian cyst with hemorrhage

Inflammation/Infection

- Diffuse peritonitis
- Chemical : due to perforated peptic ulcer, bile leak, ruptured ovarian cyst
- Infection : secondary bacterial peritonitis or primary bacterial peritonitis with foreign body (e.g., peritoneal dialysis catheter)
- Localized peritonitis
- Appendicitis
- Cholecystitis
- Pancreatitis

- Meckel’s diverticulitis
- Diverticulitis
- Intra-abdominal abscess
- Mesenteric lymphadenitis
- Pelvic inflammatory disease
- Gastroenteritis
- Hepatitis
- Tubo-ovarian abscess
- Acute ileitis
- Colitis

Perforation

- Gastrointestinal tract
- Esophagus
- Stomach
- Duodenum
- Small intestine
- Colon
- Gallbladder

Ischemia

- Intestinal
- Arterial embolus
- Mesenteric vein thrombosis
- Closed loop obstruction
- Splenic infarction
- Hepatic infarction

- Omental or Mesentric ischemia / infarction
- Infarction of appendix epiploica
- Torsion of the ovary
- Torsion of a uterine fibroid

Obstruction

- *Gastrointestinal*: due to adhesions, hernia, tumour, volvulus, intussusception, faecal impaction
- *Biliary obstruction*: due to stones, tumour, hemobilia

EXTRA-ABDOMINAL DISEASES THAT CAN MIMIC AN ACUTE ABDOMEN

Thoracic

- Pneumonia
- Empyema
- Myocardial infarction

Metabolic

- Porphyria
- Diabetes mellitus
- Addisonian crisis
- Uremia

Toxin-induced

- Lead poisoning
- Arsenic poisoning
- Snake and spider venom
- Insect bites

- Tetanus
- Drugs

Genitourinary

- Pyelonephritis
- Upper urinary tract obstruction
- Torsion of the testicle
- Epididymitis
- Torsion of testicular appendages

Hematologic

- Sickle cell crisis
- Leukemia

Neurologic

- Spinal cord tumour
- Osteomyelitis of spine
- Herpes zoster

Abdominal Wall

- Hematoma

Psychogenic

SURGICAL ASPECTS OF INTRA ABDOMINAL TRAUMA

Abdominal trauma can be due to,

- Traumatic ○ Blunt injury ○ Penetrating injury
- Nontraumatic (Instrumentation Injury)

BLUNT INJURY ABDOMEN

Injuries of the abdominal viscera caused by blunt trauma are particularly common in civil life.

In a series observed in the Massachussets General Hospital, Rodkey found that 85% of 209 injuries seen among a period of 5 years were of this type in contrast to 15% that followed penetrating wounds.

In blunt trauma, solid organs are much more likely to be damaged by compression from blunt trauma than the hollow viscera. Thus spleen, liver, kidney and pancreas are especially vulnerable while the small intestine, colon, rectum are less likely to be involved.[25]

The outstanding features of injuries to solid organs are hemorrhage and shock.

In hollow visceral injury; shock follows the development of peritonitis.In so far as the intestinal tract itself is considered, there are certain fixed points that are specially likely to rupture. They include the retroperitoneal portion of the duodenum, upper foot of jejunum, caecum, hepatic and the splenic flexures of the colon.

It should be noted that, apparently trivial blows might lead to quite serious injuries. Sometimes the spleen may be ruptured by a single blow. But the same is not true with hollow viscera, which do not perforate with trivial injuries.

Williams and Sergent, both in experimental and clinical practice, have studied the mechanism of intestinal injury in trauma. They found that intraperitoneal pressures were always greater than the intraluminal pressures of the gut. The injuries always occurred anterior to the spine and were always prevented, if the striking force stopped short of spine. Thus, the shearing between two opposing surfaces is the primary cause of intestinal injury owing to blunt trauma.[26]

In further experience with explosive decompression, these workers found that, in dogs, there were no intestinal injuries even if, the gut has been previously distended or obstructed.[26]

Non-traumatic perforating wounds involve viscera approximately in proportion to the volume of space each of them occupies. Consequently in comparison with blunt trauma, there is a great increase in the frequency of wounds of the small bowel and colon.

SPLEEN

Spleen is the commonest organ injured in intra abdominal injuries. It may be injured by such a trivial trauma, be a blow over the abdomen or the more extensive thoracoabdominal injuries by road traffic accidents.[25]

Diagnosis of splenic injury in penetrating trauma is easy but, more often difficult in blunt injures. The clinical manifestations are signs of shock with local evidence of periotoenal irritation. Sometimes the signs of shock may be delayed for a variable period (subcapsular hematoma). Only 30-40% of patients with splenic trauma develops hypotension of below 100 mm of Hg of systolic pressure. However, many patients with splenic injuries develop hypotension and tachycardia in sitting posture. Tender abdomen with guarding and distention is present in only about 50-60% of patients with splenic rupture. The other clinical signs are Kehr's sign and Balance sign. In light of local findings and X-ray evidence of fracture lower ribs, fundic gas shadow displacement etc., only give a clue to the diagnosis, which can be further confirmed by abdominal paracentesis.

Delayed rupture of spleen was first described by Baudot in 1902 and asymptomatic interval between abdominal injury and rupture of spleen is known as 'Latent period of BAUDOT'[25].

The causes of this delayed rupture according to Baudot are,

1) Subcapsular hematoma gradually increased in size until it caused a delayed rupture.
2) The initial bleeding from a splenic laceration ceased spontaneously but began several days or weeks when the perisplenic hematoma becomes dislodged.

This concept has been challenged recently by Delen and Polley and

Benjamin. They have reported delayed rupture of spleen in less than 1% of their 600 patients, and concluded that, high incidence of delayed rupture which was thought originally is due to delay in diagnosis rather than delayed rupture.

LIVER

Liver being the largest and the most vascular organ in the abdomen, reluctant hemorrhage constitutes a serious threat to life. It is suspected in all patients with penetrating or blunt trauma to the lower chest or upper abdomen.

In penetrating injuries, liver is the second most common organ involved, small bowel being the commonest. In blunt trauma, liver is second only to the spleen. Spontaneous rupture of liver is very rare when compared to the spleen.[26]

The commonest site of laceration of liver is the upper border of the right lobe of liver. The rent may be small or it may be ragged and deeply extending through the liver substance or very rarely there may be complete rupture of the liver and several pieces of it may lie amidst the blood stained coils of intestine.

CENTRAL RUPTURE OF LIVER

Sometimes following forceful torsion, there may be a deep contusion in the liver, though externally the organ may be completely normal. These cases are difficult to diagnose and are liable to produce traumatic haemobilia.

Liver injury is suspected in any patient with history of injury to the upper abdomen develops signs of shock with guarding and tenderness of the upper abdomen. In penetrating injuries, the site and direction of the wound will support the diagnosis but the same is not true with patients who sustained blunt trauma particularly in unconscious patients with associated injuries. It is in these cases that peritoneal tap clinches the diagnosis. Diagnostic tap gave 95% accuracy in MOHALL and SHRIES series in 1965.

SMALL BOWEL

Of all the injuries to the gastrointestinal tract, injury to the small bowel is the commonest. Though commonest, for the prognostic point of view, less dangerous than duodenal and colonic injuries.[24]

Patients with small bowel injuries usually present with signs of peritonitis due to contamination of the peritoneal cavity with ileal contents. Sometimes patients may present purely with signs and symptoms of hemorrhagic shock in which case is associated with mesenteric laceration.

The mortality and morbidity of patients with bowel injury increases when there is associated mesenteric laceration in addition to the rupture of the bowel or multiple injuries of bowel. An early diagnosis can be established in these cases, when there is clinical suspicion of bowel injury by doing peritoneal tap. Here the presence of amylase and coliform organisms in aspirated fluid clinches the diagnosis of bowel perforation.

STOMACH

Injuries to the stomach from blunt trauma are rare because of relative lack of fixation and it's protected position. However, perforation injuries of the stomach are not infrequent. Diagnosis can be established in addition to the usual procedure by aspirating bile fluid by the peritoneal tap.

DUODENUM

Duodenum may be injured like other viscera by blunt trauma or penetrating injuries. It is characteristic of penetrating duodenal wounds, that nearly always other organs are involved like the pancreas, colon, liver, kidney and intestines.[25]

Duodenal injuries may be intraperitoneal or retroperitoneal. The latter groups are more difficult to diagnose and the mortality is high. The most likely areas of rupture are at the two extremities of the duodenum, particularly where the duodenum crosses the spine just proximal

to the ligament of Trietz. Traumatic hematoma of the duodenum occurs mostly in the second part.

The basis for diagnosing an intraperitoneal rupture of duodenum is similar to that of a perforated duodenal ulcer. Plain X-ray of the abdomen may or may not reveal a gas shadow. The abdominal paracentesis will confirm the diagnosis.

Retroperitoneal injuries are more difficult to diagnose. Plain X-ray of abdomen may help (Gas around the kidney) to some extent. These injuries, like other retroperitoneal injuries (kidney and pancreas) are difficult to diagnose by peritoneal tap.

COLON:

Acute injuries of the colon and rectum results from various types. It may follow penetrating or blunt trauma.

A systematic diagnostic approach to problems of abdominal trauma is necessary. Specific examination of colon and rectum is necessary to delineate injury. Rectal examination and sigmoidoscopy should occupy a prominent place in examining these patients. Abdominal paracentesis may confirm the diagnosis.

BILIARY SYSTEM

Although perforation of gall bladder due to blunt trauma is unusual, may be injured in penetrating trauma.

The usual means of closed injury to the extra hepatic biliary system is a shearing force applied to the common bile duct or impingement of the bile duct between the vertebral column and a crushing force applied to the abdominal wall.[24]

Diagnosis can be confirmed by aspiration of bile or nonclotting blood on peritoneal tap.

OTHER VISCERAL INJURIES

Injuries to pancreas and kidneys being retroperitoneal are difficult to diagnose and relatively rare. They usually do not produce any intraperitoneal signs.

Intraperitoneal rupture of urinary bladder and ruptured ectopic pregnancy do produce signs and symptoms of shock with lower abdominal tenderness, rigidity and guarding. Peritoneal tap helps in diagnosing and differentiating these two, as the former produces intraperiotneal extravasation of urine and the later blood.

Injuries to major vessels like aorta, inferior vena cava etc is usually fatal.

PHYSICAL CHARACTERISTICS OF THE ASPIRATED FLUID.

Bile stained fluid

- Perforated duodenal ulcer.
- Perforated gall bladder
- Perforated bile duct
- Perforated gastric ulcer
- Spontaneous bile peritonitis

Blood stained fluid without trauma

- Adult pancreatitis
- Mesenteric embolism

Blood without trauma

- Ruptured ectopic gestation
- Ruptured lutein cyst.
- Spontaneous rupture of spleen.
- Rupture of an aneurysm.

Clear straw coloured fluid:

- Gastroenteritis.
- Tuberculous peritonitis.

Porridge like material

- Ruptured dermoid cyst of ovary and mesentry

Crystal clear fluid

- Ruptured hydatid cyst

Odourless purulent fluid

- Perforated peptic ulcer.
- Unperforated acute appendicitis
- Salphingitis
- Suppurating mesenteric lymph nodes
- Early cases of diverticulitis with perforation
- Pneumococcal peritonitis.

Purulent fluid with odour

- Perforated appendix
- Perforated colonic diverticulitis
- Perforated meckels diverticulitis.
- Distal small bowel and large bowel perforation.

METHODOLOGY

All acute abdominal cases admitted to the emergency surgical wards in TIRUNELVELI MEDICAL COLLEGE HOSPITAL from JULY 2014 to AUGUST 2015 were included in the study. A total of 50 cases were studied during this period. All patients with acute abdominal pain, both traumatic and non traumatic, ages between 12 and 70 years and patients with shock and suspicion of acute abdomen were included in the study. Patients were evaluated in the following ways.

1. Accurate history was taken with respect to the
    - Pain - Onset, type, site, progress, aggravating and relieving factors.
    - Vomiting
    - Distention of abdomen
    - Bowel and bladder disturbance
    - Menstrual disturbance.
2. Vital signs of the patient were recorded.
3. Thorough clinical examination was done for the evidence of abdominal tenderness, guarding, rigidity, obliteration of liver dullness and peristalitic sounds.

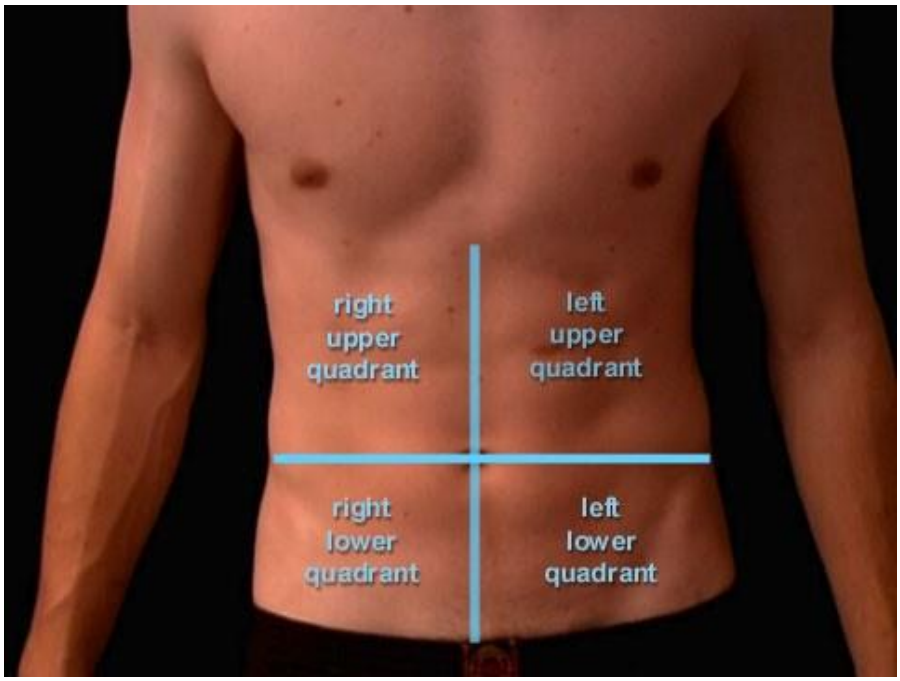
Based on the history and clinical examination, provisional clinical diagnosis was made and routine investigations like CBC, blood sugar, urea , creatinine, liver function tests were done in all patients. Specific investigations like erect X-rays abdomen, USG abdomen and pelvis and CT was done depending on provisional diagnosis and their requirement.

The patients with the following diagnosis were excluded from the study.

1. All pregnant patients.
2. All patients suspected of acute intestinal obstruction
3. All patients with extensive abdominal scar

4. All patients with acute non perforative biliary tract disease, acute gastritis and acute appendicitis.
5. All patients with renal or ureteric calculi.

Before the patient was subjected to the four quadrant peritoneal tap, erect X-ray abdomen was done, reasons being, the theoretical chances of air being either introduced into the peritoneal or sucked from the peritoneal cavity while performing the procedure.



REQUIREMENTS OF PARACENTESIS

Peritoneal paracentesis is a very simple bedside procedure, which requires minimal experience. The procedure requires no sophisticated material and can be carried out without much discomfort to the patient. The advantage is that, it can be performed in any ward of the hospital and can be repeated.

All that is required is:

- A 5 or 10 ml disposable syringe to which 18 or 20 gauge or venflon needle is attached.
- An antiseptic swab.

PROCEDURE OF THE PARACENTESIS

- Urinary bladder is emptied before the procedure.
- Abdomen is exposed.
- Abdomen is arbitrarily divided into four quadrants.
- The procedure is performed without local anesthesia.
- The site of the paracentesis is located and swabbed with a povidone – iodine followed by spirit.
- The abdomen is always entered lateral to the lateral border of the rectus sheath.
- The first puncture is always made in the right lower quadrant followed by left lower quadrant, right upper and left upper quadrant in that order.
- The syringe with needle is introduced perpendicularly into the abdomen with slow even pressure, sudden loss of resistance will indicate that it has entered the peritoneal cavity.
- Aspiration is done and any return of fluid into the syringe is looked for.
- If nothing aspirated immediately, the vaccum in the syringe is maintained for some time to get a positive tap, when the amount in the peritoneal cavity is small.
- Despite of this, if fluid was not drawn, the needle is withdrawn slowly, maintaining the steady suction within the syringe, as the fluid will be more frequently encountered just beneath the anterior parietal peritoneum than in the depth of the peritoneal cavity.
- Initially tap is performed in the right lower quadrant, if negative, the next site of choice would be the left lower quadrant followed by right upper quadrant and finally in the left upper quadrant. In cases of four quadrant tap being negative/dry, the decision for further management will be based on clinical and radiological investigation. If the decision for surgery is made, peritoneal tap will be done in operating room before inducing the patient.

- Then the aspirated fluid was transferred to a sterile container and sent to the microbiological lab for fluid analysis

CRITERIA FOR POSITIVE TAP:

The tap is regarded as “positive”;

1. If opaque fluid in excess of 0.5 ml has been obtained.

2. The fluid is obviously abnormal (i.e)if aspirated fluid contains bile, pus, haemorragic or feculent etc.

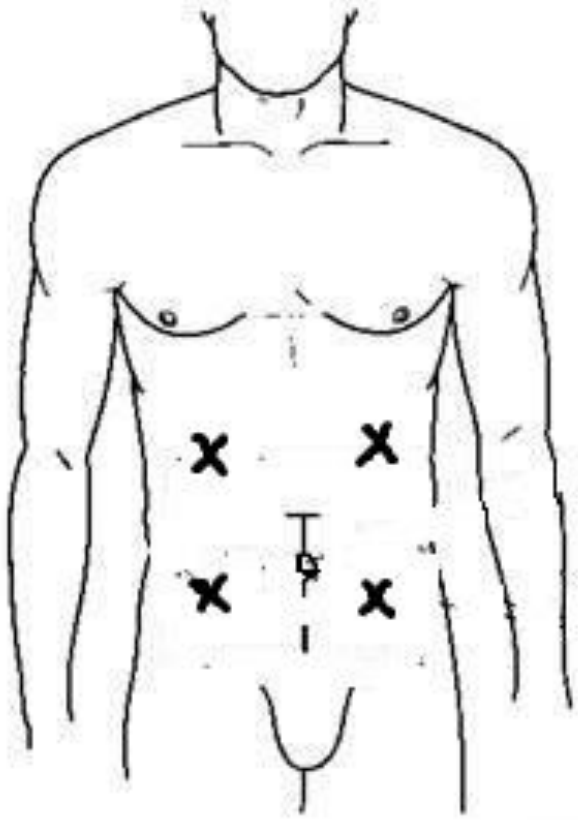
3. On peritoneal fluid cytology, if aspirated fluid contains cell count WBC > 500 cells/cu.mm or/and RBC > 1 lakh cells/cu.mm ; cell count ratio (ratio between WBC and RBC count in lavage fluid divided by the ratio of the same parameters in the peripheral blood) > 1 considered as positive microscopic findings.

CRITERIA FOR NEGATIVE / DRY TAP

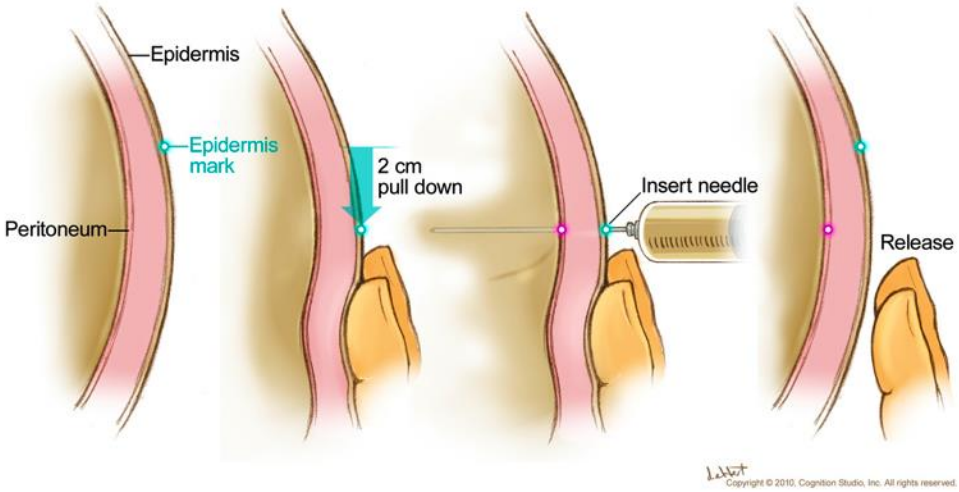
1. If no fluid was aspirated from any of the four quadrants considered as dry tap.
2. If peritoneal fluid cytology shows WBC < 100 cells/cu.mm or/and RBC < 50,000 cells/cu.mm ; cell count ratio (ratio between WBC and RBC count in lavage fluid divided by the ratio of the same parameters in the peripheral blood) < 1 considered as negative microscopic findings.

MATERIALS USED IN THE STUDY

SITES FOR ABDOMINAL PARACENTESIS



PARACENTESIS PROCEDURE

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FLUID ANALYSIS

The fluid aspirated from the peritoneal cavity was analysed macroscopically and microscopically.

Naked eye examination (macroscopic) of the nature of the fluid, odour and texture were relied upon to arrive at a conclusion. Depending upon the nature, odour and texture of the fluid, diagnosis of site of pathology was made.

Microscopic examination of the fluid by cytology.

MACROSCOPIC FLUID ANALYSIS :

ASPIRATED FLUID GROSSLY ANALYSED FOR COLOUR, NATURE, ODOUR AND TEXTURE OF THE FLUID.

Frank blood

Withdrawal of pure blood that fails to clot on standing means that a significant intraperitoneal hemorrhage has occurred. Accidental puncture of a blood vessel does occur but can readily be distinguished by the fact that blood from this source clots within few minutes.

Purulent fluid

This may vary from the offensive frank pus obtained from a perforated appendix or diverticulitis of the colon, to the thin turbid fluid associated with localised inflammatory disease.

Bile stained

Bile stained fluid is seen in upper gastrointestinal perforations and biliary tree injuries.

Serosanginous fluid

This type of tap is seen in strangulated hernia and acute pancreatitis.

Odour

A feculent smell is due to perforation of large intestine. In intraperitoneal rupture of urinary bladder, there will be a uriniferous odor. Foul smell is seen in primary peritonitis.

Texture

In perforated gastric or duodenal ulcer, the fluid tends to be turbid or purulent with flecks of amorphous fibrinous material. In pancreatitis, the fluid will be turbid with fat globules.

MICROSCOPIC ANALYSIS (CYTOLOGY) :

The aspirated fluid is sent to lab in a sterile container for cytology.

The peritoneal fluid is analysed for total WBC and RBC count and cell count ratio was also obtained.

If cytology shows, WBC > 500 cells/cu.mm or/and RBC > 1 lakh cells/cu.mm; cell count ratio (ratio between WBC and RBC count in lavage fluid divided by the ratio of the same parameters in the peripheral blood) > 1 considered as ***positive microscopic findings***.

If peritoneal fluid cytology shows WBC < 100 cells/cu.mm or/and RBC < 50,000 cells/cu.mm; cell count ratio (ratio between WBC and RBC count in lavage fluid divided by the ratio of the same parameters in the peripheral blood) < 1 considered as ***negative microscopic findings.***

RESULTS

OBSERVATIONS:

A total of 50 cases of acute abdominal emergencies admitted to the emergency surgical ward of Tirunelveli Government Medical college Hospital were studied.

Details regarding the age, sex, occupation, address, presenting symptoms physical signs and the characteristics of the aspirated fluid were studied and analysed.

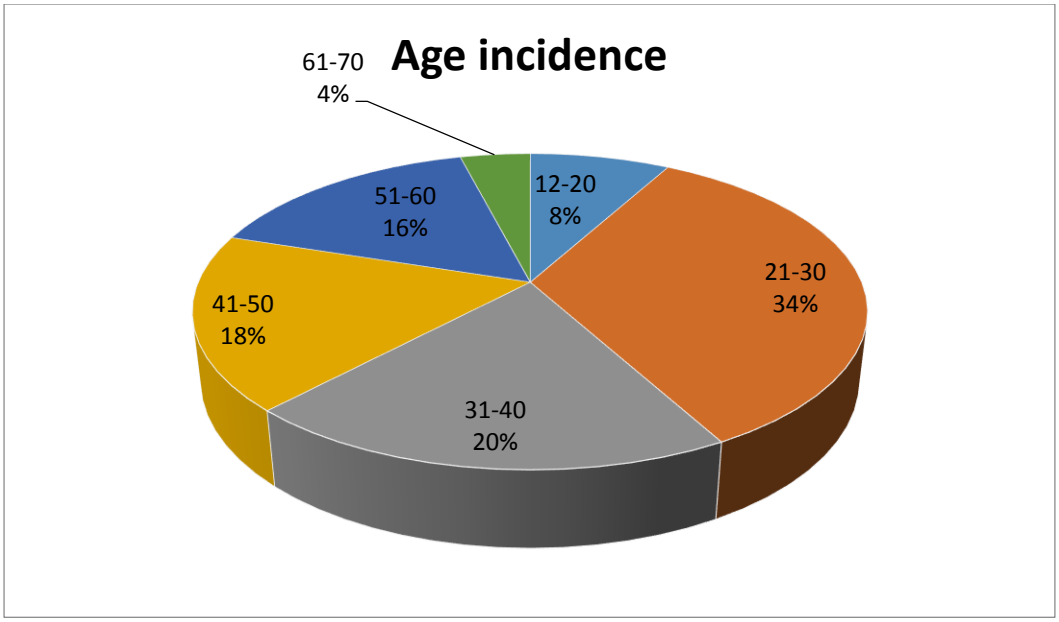
Vital signs were examined and a complete systemic examination of the patients was done. The patients were put on nasogastric aspiration, IV fluids, antibiotics, analgesics and antacids. Patients were catheterised depending on the need for the same. Patients presenting in shock were resuscitated. Routine investigations were sent including blood grouping. In suspected perforative peritonitis erect x-ray abdomen was done before the tap.

Once peritoneal tapping with fluid cytology was done and diagnosis made, patients were also subjected to other radiological investigations (USG and CT) depending upon their need and our diagnosis confirmed, patients were taken up for surgery and definite surgical procedures done.

For patients with inconclusive diagnosis after tapping, other investigations like USG abdomen, CT abdomen were taken and depending upon clinical circumstances , patients were subjected to operative / non operative management.

Table No. I: Age incidence

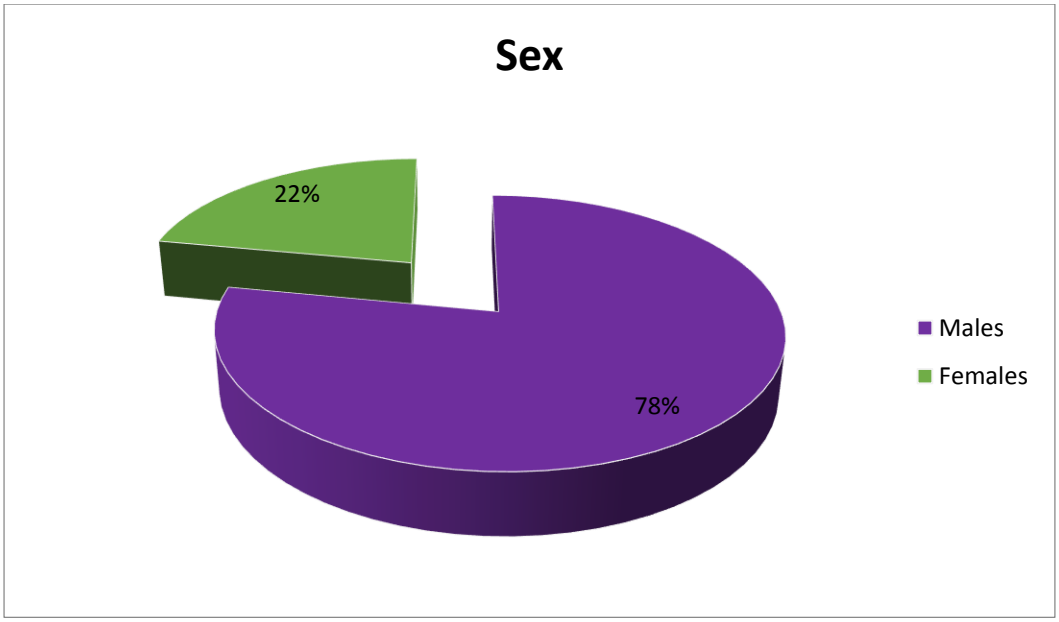
Age group in years	No. of cases	Percentage
12 – 20	4	8
21 – 30	17	34
31 – 40	10	20
41 – 50	9	18
51 – 60	8	16
61 – 70	2	4



Out of 50 cases, 17 were from 21 to 30 age group. Next common age group was between 31-40 years, which constituted 10 cases followed by 41-50 age group, which constituted 9 cases.

Table No. II: Sex incidence

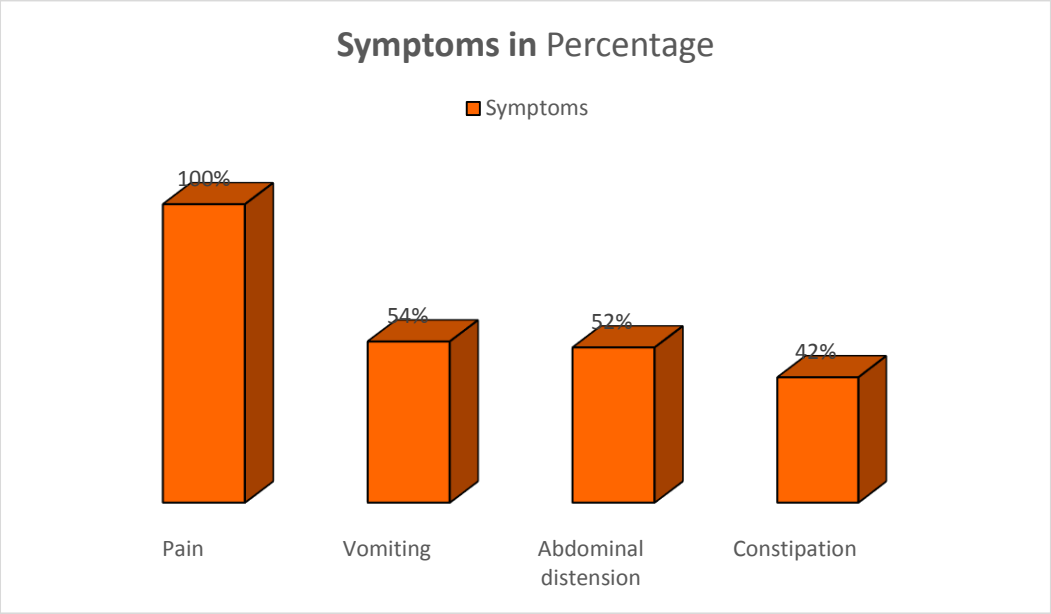
Sex	No. of Cases	Percentage
Males	39	78
Females	11	22
Total	50	100



Out of 50 cases studied, there were 34 male patients and 16 female patients. In this study males were affected more than the females.

Table No. III: Symptoms

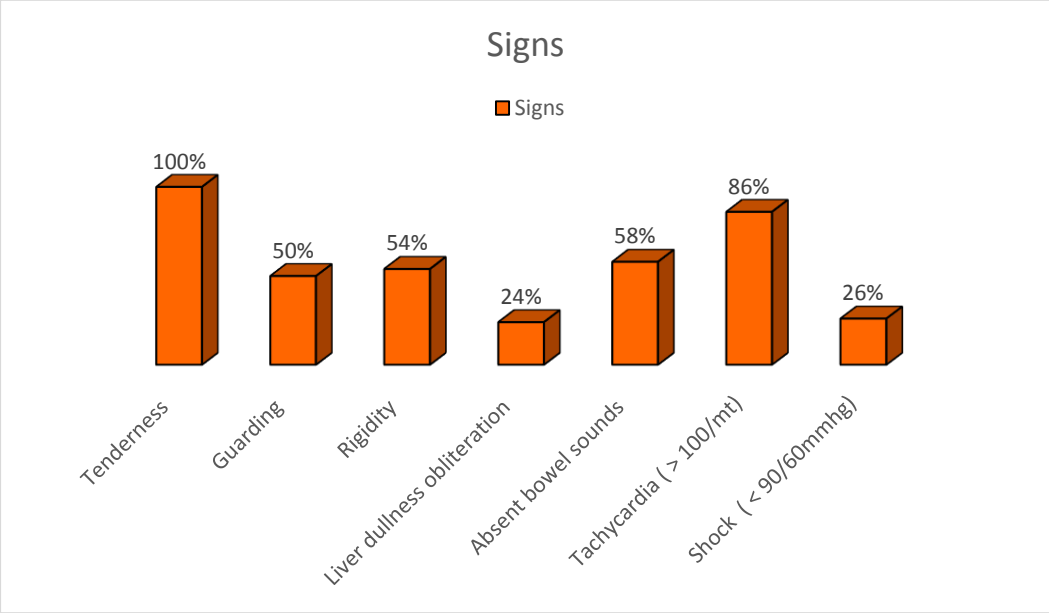
Symptoms	No. of cases	Percentage
Pain	50	100
Vomiting	27	54
Abdominal distension	26	52
Constipation	21	42



The most common symptom in our study was abdominal pain, present in 50 cases (100%) followed by vomiting in 27 cases (54%), abdominal distension in 26 cases (52%) and least being constipation in 21 cases (42%).

Table No. IV: Signs

Signs	No. of cases	Percentage
Tenderness	50	100
Guarding	25	50
Rigidity	27	54
Liver dullness obliteration	12	24
Absent bowel sounds	29	58
Tachycardia (> 100/mt)	43	86
Shock (< 90/60mmhg)	13	26

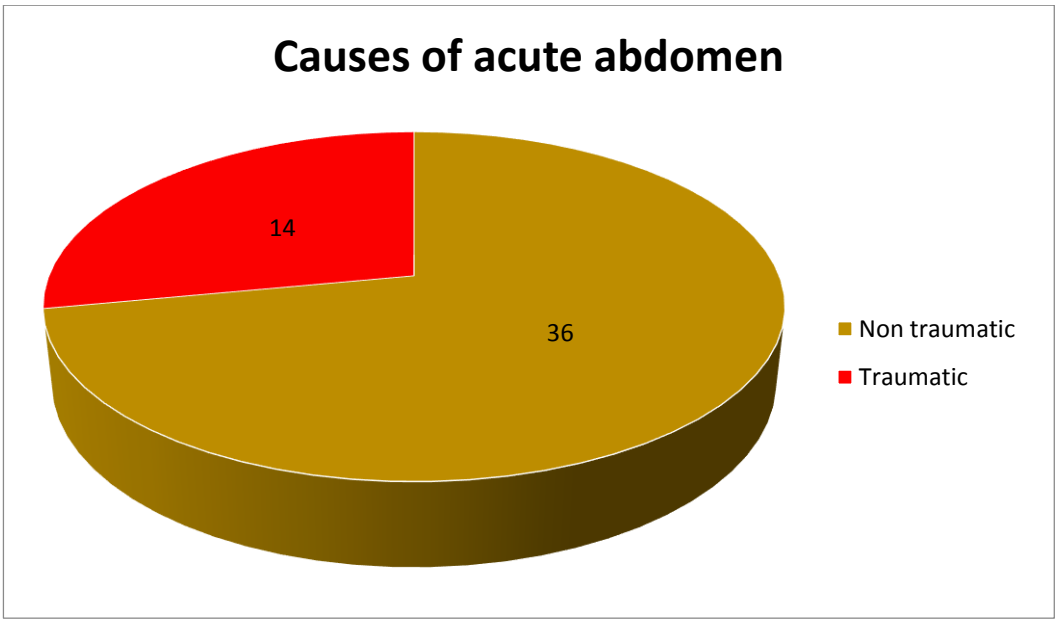


Abdominal tenderness was the most common sign present in all cases(50),

Guarding was present in 25 cases, rigidity was noted in 27 cases, and liver dullness was obliterated in 12 cases .Absent bowel sounds in 29 cases. Tachycardia was noted in 43 cases. Diagnosis of shock was made in 13 cases.

Table No. V: Causes of acute abdomen

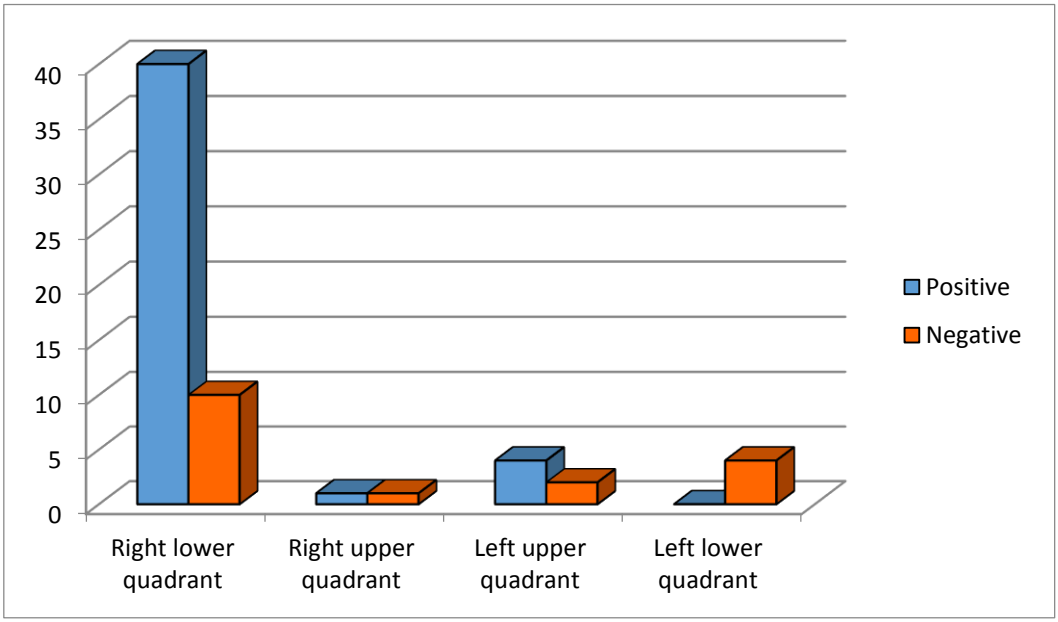
Causes of acute abdomen	No. of patients
Non traumatic	36
Traumatic	14



Out of 50 cases 36 were due to non-traumatic abdominal pathology and 14 cases were caused by traumatic factor.

Table No. VI: Site of the Positive Tap

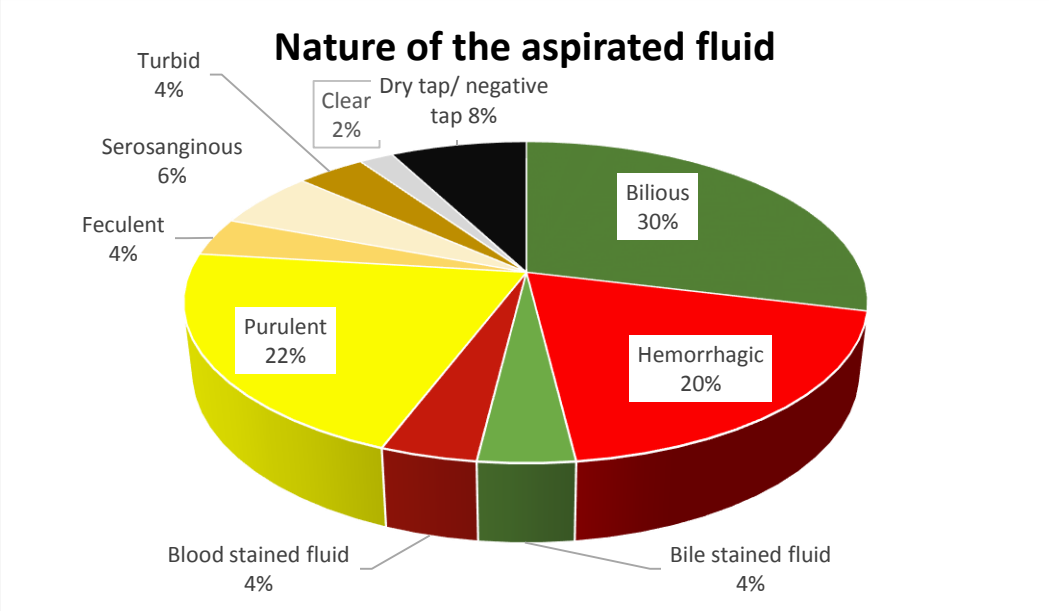
Site of the tap	No. of tap performed	Positive	Negative
Right lower quadrant	50	40	10
Right upper quadrant	02	01	01
Left lower quadrant	06	04	02
Left upper quadrant	04	00	04



Initially the procedure was carried out in the right lower quadrant in all 50 patients, of which 40 were positive and tap was not repeated. For 6 cases, tap was positive in left lower quadrant and in 04 cases, tap was positive in left upper quadrant and in 2 cases, taps was positive in right upper quadrant.

Table No. VII: Nature of the aspirated fluid.

Nature of the aspirated fluid	No. of cases	Percentage
Bilious	15	30
Hemorrhagic	10	20
Bile stained fluid	02	4
Blood stained fluid	02	4
Purulent	11	22
Feculent	02	4
Serosanginous	01	6
Turbid	02	4
Clear	01	2
Dry tap/ negative tap	04	08



A lot of information can be gathered by gross examination of the aspirated fluid. Most of the times, the physical characters of the aspirated fluid will give a probable clue to the pathology.

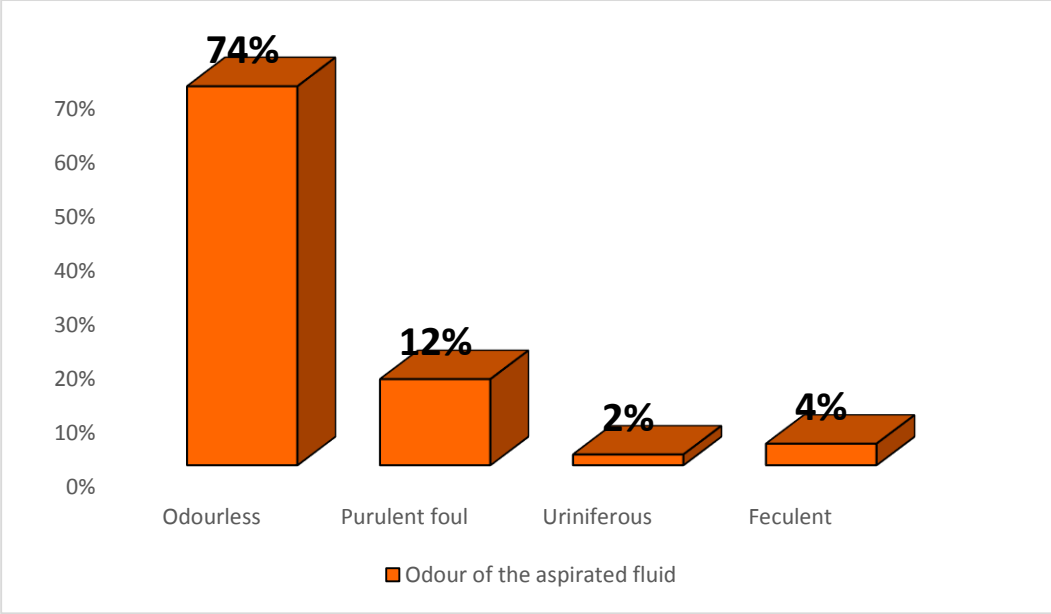
In the present study of 50 cases, we could aspirate the characteristic fluid in 46 cases. The most common type of fluid we aspirated was bilious in 15 cases.

Purulent fluid was seen in 11 cases. Feculent in 2 cases, Turbid fluid was noted in 02 cases. Clear fluid in 01 case.

Serosanginous fluid was positive in 03 cases. Hemorrhagic fluid was positive in 10 cases blood stained fluid in 02 cases and bile stained in 02 cases.

Table No. VIII: Odour of the aspirated fluid.

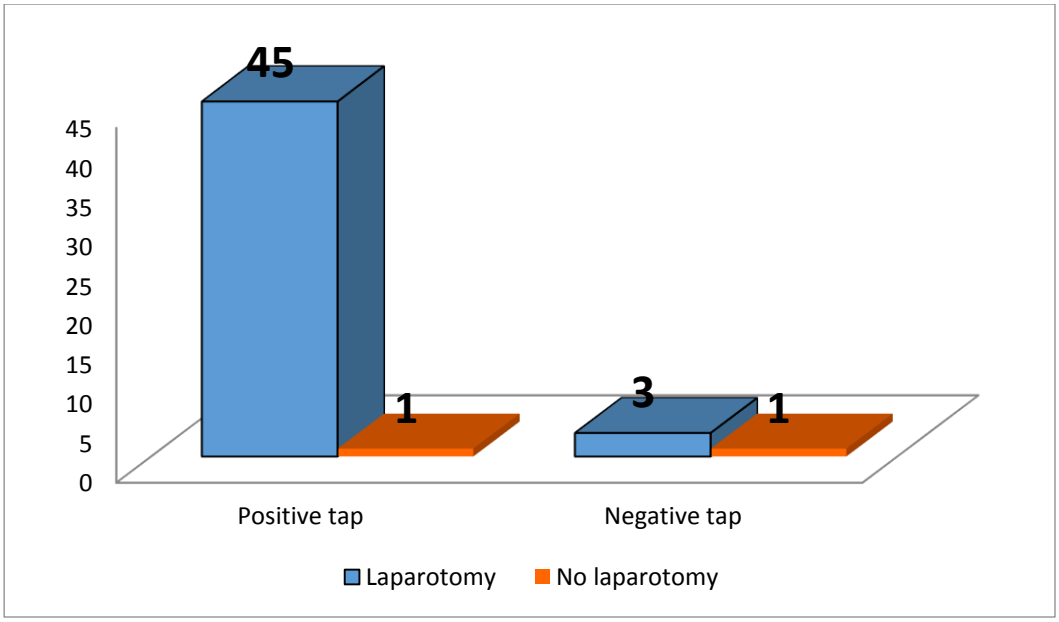
Odour of the aspirated fluid	No. of cases	Percentage
Odourless	37	74
Purulent foul	06	12
Uriniferous	01	2
Feculent	02	4



In cases of positive taps, we noticed odourless fluid in 37 cases, purulent foul smell in 6 cases , Feculent odour in 2cases , uriniferous in 1 case.

Table No. IX: Relations of Tap with Laparotomy

Tap		No. of Cases
Positive tap (46 cases)	Laparotomy	45
	No laparotomy	01
Negative tap (4 cases)	Laparotomy	03
	No laparotomy	01



Out of 46 positive study group, 45 patients were subjected to laparotomy. In every case, pathological fluid in the peritoneal cavity at operation was correlated with the finding of pre-operative paracentesis. In one patient with diffuse peritonitis with suspected intra

abdominal pathology, paracentesis revealed a turbid fluid in the right hypochondrium, further radiological investigations confirmed the diagnosis as acute cholecystitis and patient managed conservatively. Out of 04 negative study group, laparotomy was done in 03 cases based on the clinical and radiological investigations and the surgery revealed a true intra abdominal pathology. Remaining 01 case, patient managed conservatively without laparotomy.

Table No. X: CYTOLOGY OF ASPIRATED FLUID

SL. NO	ACUTE ABDOMEN	NO OF POSITIVE PERITONEAL CYTOLOGY			NO OF NEGATIVE PERITONEAL CYTOLOGY		
		WBC>500 cells / cu.mm	RBC>1 lakh cells / cu.mm	Cell count ratio >1	WBC<100 cells / cu.mm	RBC <50000 cells / cu.mm	Cell count ratio <1
NON – TRAUMA GROUP							
1	**Visceral perforations**						
i.	Stomach	6	-	6	-	-	-
ii.	Duodenum	9	-	9	-	-	-
iii.	Small bowel	5	-	5	-	-	-
iv.	Appendix	5	-	5	-	-	-
v.	Gall Bladder	1	-	1	-	-	-

2	**Diffuse peritonitis with suspected intra abdominal pathology**						
i.	Intra abdominal abscess	2	-	2	-	-	-
ii.	Post anastomotic leak	1	-	1	-	-	-
iii.	Acute cholecystitis	1	-	1	-	-	-
iv.	Mesentric ischemia	1	-	1	-	-	-
V.	Ileo-ileal knotting	1	-	1	-	-	-
3	**Ruptured ectopic pregnancy**	-	1	1	-	-	-
TRAUMA GROUP							
i.	Liver laceration	-	4	4	-	-	-
ii.	Splenic laceration	-	3	3	-	-	-
iii.	Mesenteric tear	-	2	2	-	-	-

iv.	Jejunal perforation	2	-	2	-	-	-
v.	Sigmoid colon perforation	1	-	2	-	-	-
vi.	Bladder Rupture	1	-	1	-	-	-
Total		**36**	**10**	**46**	**0**	**0**	**0**
		46			**0**		

Table No. XI: RELATIONSHIP BETWEEN PPERITONEAL CYTOLOGY WITH LAPAROTOMY

Peritoneal fluid cytology	Laprotomy	No. of Cases
Positive Microscopic findings RBC > 1 lakh cells / cu.mm or / and WBL > 500 cells / cu.mm ; cell count > 1	Laparotomy	45
	No Laparotomy	01
Negative Microscopic findings RBC < 50,000 cells / cu.mm WBL < 100 cells / cu.mm ; cell count < 1	Laparotomy	00
	No Laparotomy	00

Out of 50 cases, 46 cases only we get a fluid aspiration from the peritoneal Cavity, for the remaining cases we didn't get any fluid on aspiration. While subjecting this fluid for cytology, we able to get a cell count of RBC > 1 lakh cells /cu.mm for 9 cases in traumatic group and 1 case in non-traumatic group, all are subjected to laparotomy and Hemo peritoneum confirmed.

For remaining 36 cases, we get a cell count of WBC > 500 cells/cu.mm with cell count ratio > 1; of these only 35 cases underwent laparotomy and obviously pathological fluid was confirmed in laparotomy. In remaining one case though we get a peritoneal fluid with turbid

and odourless in nature with cytology shows increased polymorphs count, further radiological investigations revealed it as a acute cholecystitis, Hence patient managed conservatively.

Table No. XII: POSITIVE TAP AND ASSOCIATED PATHOLOGY.

Non Traumatic Group	No. of Patients	Traumatic Group	No. of Patients
Gastric perforation	06	Splenic laceration	03
Duodenal perforation	09	Liver laceration	04
Ileal perforation	05	Jejunal perforation	02
Appendicular perforation	05	Mesentric tear	02
Gall bladder perforation	01	Sigmoid colon perforation	01
Post Anastamotic Leak	01	Bladder rupture	01
Ruptured ectopic Pregnancy	01		
Intra-abdominal abscess (Ruptured liver abscess and splenic abcess)	02		
Strangulated small bowel(mesenteric ischemia and ileo ileal knotting)	02		
Acute cholecystitis	01		
Total	**33**	**Total**	**13**

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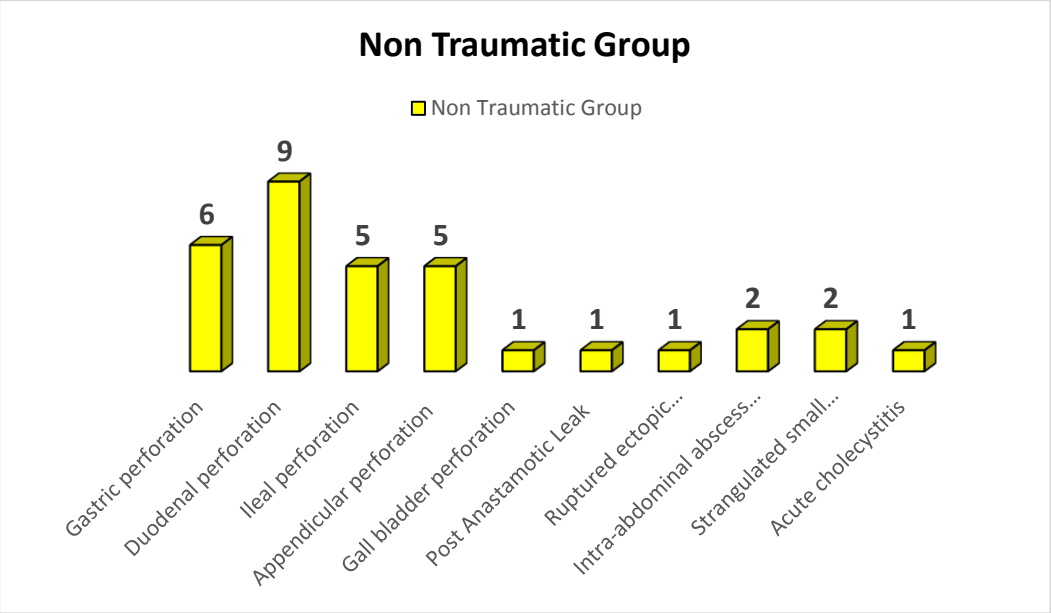
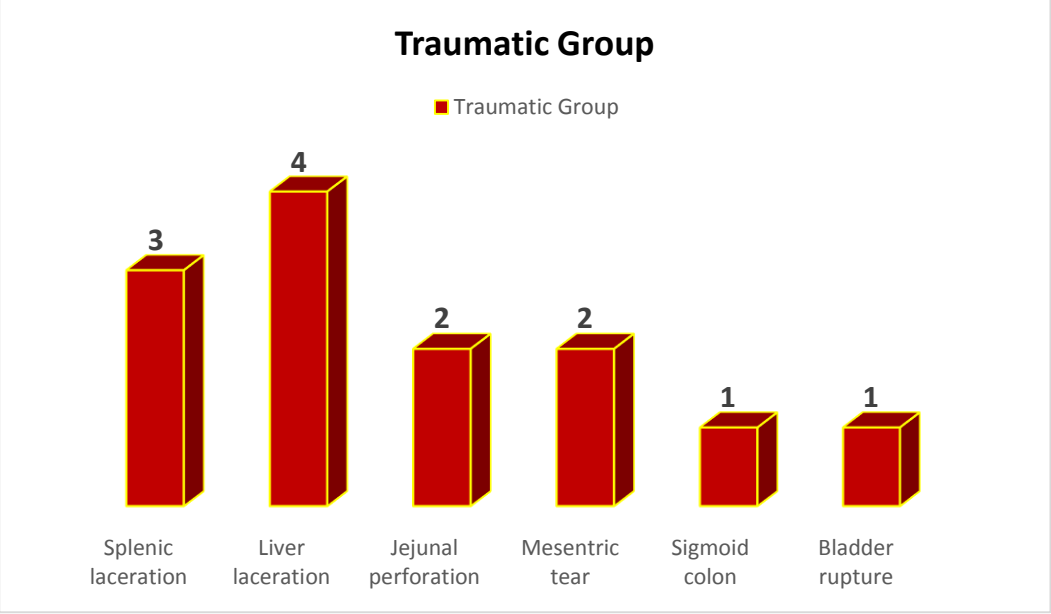


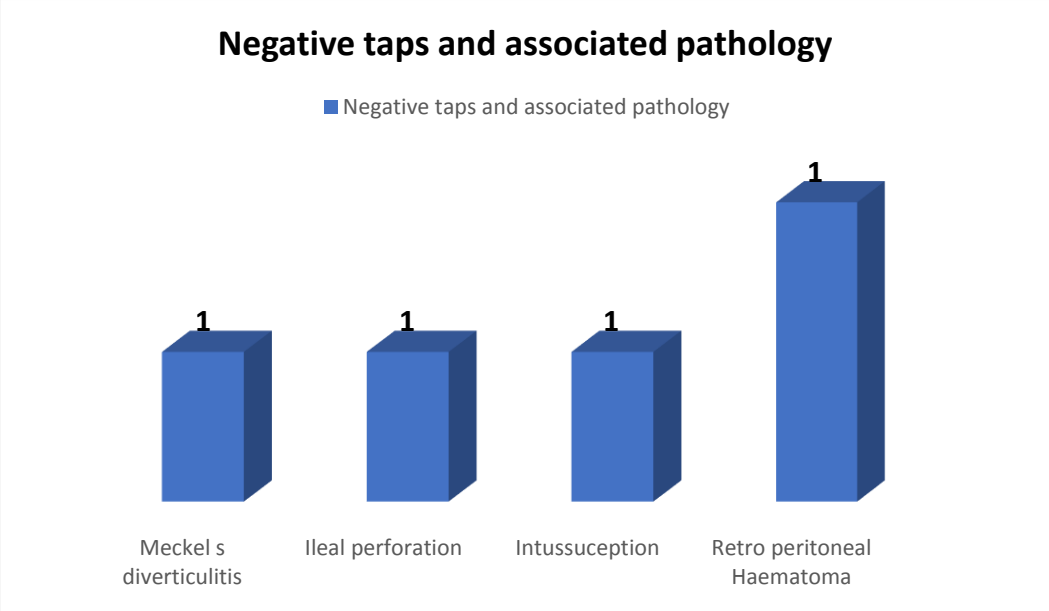


In the present study there were 46 positive taps, among them 33 cases were non-traumatic and 13 cases were traumatic. Out of 33 cases in nontraumatic group, 6 cases were gastric perforation, 9 cases were duodenal perforation, 05 cases were ileal perforation, 05 cases

were appendicular perforation, 01 case is ruptured ectopic pregnancy, 01 case is diffuse peritonitis with post anastomotic leak, 02 cases were intra abdominal abcess due to ruptured liver and splenic abcess, 01 case due to gall bladder perforation, 02 cases were small bowel strangulation due to mesenteric ischemia and ileo ileal knotting. In one patient there was a positive tap but further investigations revealed as acute cholecystitits and managed conservatively. Of the 13 cases in traumatic group 04 were due to liver injury, 03 cases due to splenic laceration, 02 cases due to mesenteric tear, and 02 cases due to jejunal perforation , 01 case due to sigmoid perforation, 01 case due to bladder rupture.

Table No. XIII: NEGATIVE TAPS AND ASSOCIATED PATHOLOGY

Pathology	No. of cases
Meckel s diverticulitis	01
Ileal perforation	01
Intussuception	01
Retro peritoneal Haematoma	01



In the present study we encountered negative taps in 04 cases. Among these, 01 case was due to Retroperitoneal hematoma, which one is managed conservatively, The remaining 03 cases were subjected to laparotomy based on clinical and radiological backgrounds which were diagnosed as meckels diverticulitis, ileal perforation, and intussuception in each one case.

Table XIV : DIAGNOSTIC ACCURACY OF ABDOMINAL PARACENTESIS

Sl. No.	Abdominal Emergencies	No of Cases	Positive Tap		Negative Tap		Diagnostic Accuracy sensitivity	Diagnostic falseness of the test
			TRUE	FALSE	TRUE	FALSE		
Non-Trauma Group								
1	**Visceral perforation**						91.42%	8.58%
i.	Stomach	6	6	-	-	-		
ii.	Duodenum	9	9	-	-	-		
iii.	Small Bowel	6	5	-	-	1		
iv.	Appendix	5	5	-	-	-		
V	Gall bladder	1	1	-	-	-		
2	**Diffuse peritonitis with suspected Intra Abdominal pathology**							
i.	Intra abdominal abscess	2	2	-	-	-		
ii.	Post Anastomotic Leak	1	1	-	-	-		
iii.	Meckel's diverticulitis	1	-	-	-	1		
iv.	Acute intussuception	1	-	-	-	1		
v.	Acute cholecystitis	1	-	1				
vi.	Mesentric ischemia	1	1	-	-	-		
vii.	Ieo-Ileal knotting	1	1	-	-	-		

3	**Intra peritoneal Haemorrhage**							
i.	Ruptured Ectopic Pregnancy	1	1	-	-	-		
	Total	36	32	01	00	03		
Trauma Group								
1	**Intra Peritoneal Haemorrhage**							
i.	Liver Laceration	4	4	-	-	-		
ii.	Splenic Laceration	3	3	-	-	-		
iii.	Mesenteric Tear	2	2	-	-	-		
iv.	Jejunal Perforation	2	2	-	-	-	100%	0%
v.	Sigmoid colon perforation	1	1	-	-	-		
vi.	Retro peritoneal Haematoma	1	-	-	1	-		
vii.	Bladder rupture	1	1	-	-	-		
	Total	14	13	00	01	00		
	Total	50	45	01	01	03	93.75%.	

In our study 50 cases were subjected to peritoneal paracentesis, tap was positive in 46 cases and negative/ dry tap in 4 cases.

In non-traumatic group, there were 36 cases of these 33 cases had a positive tap. In 1 case, a 48 year old male patient with feature of diffuse peritonitis, where history and

examination are equivocal, tapping revealed a turbid fluid containing polymorphs in the right hypochondrium but subsequent radiological investigations confirmed the diagnosis as acute cholecystitis and patient recovered on conservative treatment without emergency surgical intervention.

In other 32 cases , we had positive tap both macroscopically and microscopically which was confirmed by emergency laparotomy. In remaining 3 cases , we had false negative result. In these case no fluid was aspirated inspite of presence of fluid in the peritoneal cavity.

The diagnostic accuracy (sensitivity) in non traumatic group was found to be 91.42% with high percentage of true positive result was found in gastroduoodenal perforations.

In traumatic group, paracentesis was positive in 13 cases. All of them underwent laparotomy with positive pathology. In one case we had negative tap and further investigations diagnosed as Retro peritoneal hematoma without intra abdominal organ injury and patient responded well to conservative line of management. Most common intra abdominal organ injury in our study was liver laceration.

The diagnostic accuracy of paracentesis in traumatic group was found to be 100%.

Our study yield, high accuracy in non traumatic visceral perforations and in traumatic acute abdomen.

The overall diagnostic accuracy of abdominal paracentesis in both non traumatic and traumatic group was 93.75%.

DISCUSSION

Several authors have emphasised the usefulness of paracentesis in various traumatic and non-traumatic acute abdominal conditions. The safety and ease with which procedure can be performed and reliability of the test has been well documented in the literature. In the present study, we performed abdominal tap in 50 patients but never encountered bowel puncture. This was probably because of exclusion of patients with intestinal obstruction and multiple abdominal scars from our study.

The procedure was easy to perform and hardly took 5 minutes. All that is required was a disposable syringe with wide bore needle. In the present study, we used 18 or 20 gauge or blood transfusion needle with 10cc disposable syringe. In the literature different authors had used variety of needles and other methods.

No attempt was made to compare the relative accuracy of this test with other diagnostic radiology.

In our present series, acute abdominal disease was more common in the male sex. 39 out of 50 cases were male accounting for 78.00% and 11 were females accounting for 22.00%. Males dominated in the blunt trauma abdomen. This is probably because of active involvement of males in day to day life and high incidence of trauma under the influence of alcohol.

Positive tap reported in the literature ranges from 52-100%. In the present series we got the positive tap in 46 out of 50 cases with an accuracy of 93.75%. This positive rate is in close confirmation with the observation made by other workers.

- Rao S.P.S (1977) performed a study on 100 cases and their positive tap rate was 81.00%.[35]
- Trivedi D. R. et al. (1971), in their series of 70 cases had positive taps in 57 cases amounting to 81.00%.[14]
- Khan M. (1975) in their series of 56 cases had 46 positive tap amounting to 82.14%.[27]

- Baker W. N. (1967) in an unselected series of 101 patients, found positive results in 83%.[12]
- Lamke L. O. (1978) did a study on 114 patients with a positive rate of 90%.[28]
- Sloop R.G.(1978) reported 94% positive rates in his study of 65 cases.[29]
- McPartlin J. F. (1971) in his study on 100 cases had positive rate of 67%.[10]
- Giacobine J. W. (1960) performed diagnostic paracentesis in 130 patients with a positive rate of 82%.[4]
- Prout W. C. (1961) had 72% positive rate in his study.[13]

Majority of cases in our series was in non-traumatic acute abdomen. 36 out of 50 cases were in this group, accounting for 72%. Peritoneal paracentesis was positive in 33 cases with true positive in 32 cases, accounting for 88.88%. Approximately similar reports have been published in the literature.

- Baker W. N. (1967) reported accuracy of diagnostic tap in 80% of cases with perforated duodenal ulcer or gastric ulcer.[12]
- Similar reports have been reported by Singh J.[31] (1973) and Thate R[2] (1974) et al.
- T. Narasinga Rao (1993) obtained 100% positive results in gastrointestinal perforation.[30]
- Mahantha (1990) showed 76.47% positive tap in non-traumatic acute abdomen.[15]

In our series, we obtained 33 positive taps in non-traumatic acute abdomen. Of which 32 had true positive i.e. the characteristic fluid aspirated correlated with the intra-operative finding. Only one case with false positive result i.e., though we aspirated turbid fluid from the peritoneal cavity, further investigations revealed it as an Acute cholecystitis and that patient treated conservatively without emergency laparotomy. Except this case We did not encountered false positive cases, this is possibly due to exclusion of patients with acute intestinal obstruction and multiple abdominal scars from our study.

Although the clinical and radiological picture in majority of visceral perforation is characteristic, there are some instances, where, the diagnosis is uncertain and in such circumstances abdominal paracentesis proves very helpful.

We encountered four such instances in our clinical study. In one case we were in diagnostic dilemma between perforative peritonitis and acute pancreatitis. This was because of both patients presented with shock and per abdomen examination revealed tenderness, guarding and rigidity. Erect x-ray abdomen showed only ground glass appearance. Diagnostic aspiration of peritoneal fluid revealed bilious. Diagnosis of perforative peritonitis was made and laparotomy done which revealed gall bladder perforation. Peritoneal paracentesis proved to be valuable in these circumstances, as opening, the patient with acute pancreatitis would have been disastrous.

In another case, a female patient presented with shock and localized lower abdominal tenderness and guarding, X-ray abdomen erect showed localized ileus, USG abdomen detects free fluid in pelvis, Diagnostic aspiration of peritoneal cavity revealed frank blood. Patient immediately taken up for laparotomy and found to be ruptured ectopic pregnancy.

In other two cases of suspected peritonitis, where radiological findings inconclusive. But diagnostic aspiration revealed bilious. Patient taken up for laparotomy and found to be a ileal perforations.

Abdominal paracentesis proved its usefulness in a postoperative case where diagnosis was difficult. We encountered such a case during our study. A 45 years old male was admitted in surgical ward with a diagnosis of perforation. He underwent emergency laparotomy with ileal anastomosis. Postoperative period was uneventful till fifth day. Patient started with soft diet and Drain was removed on sixth postoperative day. On eighth post-operative day, patient developed breathlessness with wheeze. On ninth postoperative day patient’s condition deteriorated with pulse rate of 116/min and with B.P. was 90/60mm of Hg.

Per abdominal Examination revealed slight distention with tenderness but no guarding, or rigidity. USG abdomen and pelvis showed moderate degree ascites with right sided pleural effusion. Bilous fluid was aspirated on peritoneal paracentesis. Laparotomy revealed anastamotic breakdown. Proximal diversion loop ileostomy colostomy and abdomen closed. Peritoneal paracentesis proved very useful in deciding the need for surgical intervention. Similar reports were published in the literature.

- Singh J. (1973) encountered three postoperative cases, where peritoneal paracentesis was very useful in arriving at the diagnosis.[31]
- Baker W. N. W. (1967) in his article published two postoperative cases where abdominal paracentesis undoubtedly helped the surgeon.[12]

In our series we encountered 36 cases of non-traumatic acute abdomen. 27 out of 36 cases were due visceral perforation. Out of 27 visceral perforations 26 cases were positive for abdominal tap, resulting in 96.29% accuracy. Thus, the present study revealed that the utility of abdominal paracentesis is considerably effective in visceral perforations. This finding is consistent with the observations of other workers.

- Rao S.P.S.[35] (1977) – 95.00%
- Singh J.[31] (19 73) - 95.00%
- Mahantha H[15] (1993) – 92.00%
- Bhatnagar V. B.[32] (1971) – 100.00%

In our series we had 15 cases of gastroduodenal perforations. Peritoneal paracentesis was positive in all of them. This high accuracy (100.00%) was possibly due to the late presentation of patients to the hospital. Average time of onset to the presentation to the hospital in our study was two to three days. The late presentation allows accumulation of fluid in the peritoneal cavity, resulting high chances of positive peritoneal tap. Thus, peritoneal tap is

particularly useful in developing country like India, where patients usually present late to the hospital.

This high accuracy in gastro duodenal perforations of our study was comparable with the observations of other workers

- Bhatnagar V. B.[32] (1971) - 100.00%
- Mahantha H.[15] (1993) . - 92.00%

In our series, we had 6 cases of ileal perforations out of which 5 cases were positive and 1 case was negative for tap. All positive cases were confirmed during the laparotomy. In the negative tap, on laparotomy there was minimal fluid in the peritoneal cavity. Negative tap in our study was possibly due to needle tip not reaching upto the fluid level or due to the collection of fluid in the most dependent portion of the peritoneal cavity, that is, in the pouch of Douglas.

Analysis of characteristic fluid aspirated helped in locating the nature and to some extent the site of lesion in perforation. In cases of peptic perforations, we could able to tap a bilious, purulent or turbid fluid with flakes. Of the 15 gastroduodenal perforations, 11 were bilious and 04 were purulent fluid with flakes. We noticed that, in perforations distal to the duodenum time aspirate was foul smelling and feculent.

In our series, we encountered two cases of gangrenous small intestine. Peritoneal tap revealed a characteristic blood stained dark fluid with foul smell. Laparotomy confirmed the same fluid with gangrenous jejunal and proximal ileum in one case due to mesenteric ischemia and in other case with gangrenous ileum due to knotting of the ileum. This shows that peritoneal paracentesis is also useful in strangulated bowel. This was also an observation by many authors.

- Moretz W. H.[5] 1954.
- Bhatnagar V. B.[32] 1971

- McPartlin J. F[10] in 1971.
- Joginder S.[31] in 1973
- Kosloske M.[33] in 1982.

In our present series, we encountered 14 patients who presented with blunt abdominal trauma and paracentesis was performed in all patients. Positive tap was obtained in 13 cases. All of them underwent laparotomy and had hemoperitoneum with visceral organ injury. 4 out 13 had liver laceration, 3 had splenic laceration. In four cases, bile mixed with blood was aspirated, laparotomy done and found that 2 were due to mesentric tear and 2 had jejunal perforation, In one case , feculent fluid was aspirated and laparotomy revealed sigmoid colon perforation. In 1 case clear fluid was aspirated with urine smell due to intra peritoneal rupture of bladder. The most common finding in our study was liver lacerataion. The diagnostic accuracy in our study, with positive paracentesis rates was 100%. We encountered 01 negative tap, radiological investigations revealed retroperitoneal hematoma, which we managed conservatively and the patients responded well to it. Thus, abdominal paracentesis has a high rate of sensitivity and specificity in detecting intra-peritoneal haemorrhage preoperatively and can be a useful guide. This was also an observation of many other workers.

- Mansoor T.[34] (2000) performed a study on 50 cases and 12 out of 13 positive were true positive with diagnostic accuracy of 91.2%
- Mahantha H.[15] (1993) reported diagnostic accuracy of 84.3% in blunt abdominal trauma.
- Lamke L. O.[28] (1978) detected intraabdominal bleeding in 90% of cases.

Overall 4 taps were negative in our study. Out of which 1 case was true negative. Further Clinical and radiological investigations revealed as a Retroperitoneal Hematoma without intra-abdominal organ injury and we managed conservatively. Thus Negative tap helped us to avoid an unnecessary laparotomy.

The remaining 03 cases were false negative, the clinical picture in all these cases was quite obvious of intraabdominal pathology. Clinical and Radiological investigations found to be suspicious of intra abdominal pathology. In these cases negative tap was not taken into consideration and decision for laparotomy was made. Findings of laparotomy were coincident with the clinical and radiological investigations. These cases were associated with minimal collection of the fluid in the peritoneal cavity. In these cases fluid was collected in the pouch of the Douglas. Negative tap may because of minimal fluid in the peritoneal cavity particularly collected in the pouch of Douglas.

The only drawback of the abdominal paracentesis encountered in our study was a negative tap. So the negative tap should be dealt cautiously. The decision for further management should be based on clinical and radiological investigation. This was also a point highlighted by many workers.

- Baker W. N. (1967) opined that, a negative paracentesis has no positive significance. If operation is indicated on clinical grounds, then, whatever may be, the fact that no fluid has been obtained from the peritoneal cavity must be completely disregarded.[12]
- Stephens F. O. (1969) concluded that a negative tap does not prove that there is no significant intra-abdominal lesion and it must only be considered along with the patients overall clinical consideration.[8]

In our series, we got the positive taps very often in the right lower quadrant. In a case of splenic laceration, we got positive tap in the left flank. In another case of ileal perforation, tap was positive in the left lower quadrant. This suggests that paracentesis does not necessary indicate the probable site of the lesion. This has also been observation of Giacobine J. N. and Baker W. N.

During our study we encountered two hemorrhagic taps that were immediately recognised as false positive. This is due to the fact that intra peritoneal fluid will not clot on

standing, whereas accidental puncture of the blood vessel will clot on standing. Non clotting of the peritoneal fluid can be explained by the fact that, peritoneum is lined by the mesothelial cell which are rich in plasminogen activators. The body's principal controlling mechanism of the clotting system is the plasma protein plasminogen. Plasminogen activators convert plasminogen to plasmin. This plasmin catalyses the breakdown of fibrin to fibrin split products, inducing clot lysis.[21]

The diagnostic accuracy of paracentesis in non-traumatic acute abdomen in the present study was 91.42% and traumatic group it was 100%.

, The overall diagnostic accuracy of paracentesis in the present study of 50 cases was 93.75% percent. This high index of reliability of paracentesis in cases of acute abdomen has also been emphasised by majority of workers.

The various rate of diagnostic accuracy attained by various workers have been depleted below.

- Mahanta[15] H. (1990) 80%
- Byrne[7] R. V. (1956) 83%
- Giacobine J. N.[4] (1960) 83%
- Prout W. C.[13] (1968) 86%
- McPartlin J. F.[10] (1971) 86%
- Rao S. P.S[35] (1977) 89%
- Lamke L. O.[28] (1978) 90%
- Stephens F. O.[8] (1969) 98%
- Bhatnagar V. B.[32] (1971) 100%

SUMMARY

The value of diagnostic paracentesis has been studied in 50 patients, admitted as cases of acute abdominal emergency.

The technique of abdominal paracentesis proved to be simple and safe. The procedure was easy to perform and hardly took 5 minutes. All that is required was a disposable syringe with wide bore needle. We used 18 or 20 gauge or blood transfusion needle with 5 or 10cc disposable syringe.

The tap was positive in 46 of 50 cases studied accounting for 92.00% and negative tap in 8% cases. Majority of cases in our series were in non-traumatic acute abdomen. 36 out of 50 cases were in this group. Peritoneal paracentesis was positive in 33 cases of non traumatic acute abdomen, with true positive in 32 cases (accounting for 88.88%). i.e. the characteristic fluid aspirated correlated with the intra-operative finding. We did not encountered false positive cases expect in one case due to acute cholecystitis, possibly due to exclusion of patients with acute intestinal obstruction and multiple abdominal scars from our study. Out of 27 visceral perforations 26 cases were positive for abdominal tap, resulting in 96.29% accuracy. Thus, the present study revealed that the utility of abdominal paracentesis is considerably high in visceral perforations. The Diagnostic accuracy in non-traumatic acute abdominal cases is 91.42%

We encountered 14 patients who presented with blunt abdominal trauma and paracentesis was performed in all patients. Positive tap was obtained in 13 cases. 4 out 12 had liver laceration, 3 had liver laceration, 1 case was due to intraperitoneal rupture of urinary bladder, 2 were due to mesentric tear and 2 had jejunal perforation. One due to sigmoid colon perforation. The most common finding in our study was liver laceratаion. The diagnostic accuracy in traumatic patients, with positive paracentesis rates was 100%. We encountered 1

case with true negative tap, which we managed conservatively and the patient responded well to it.

Thus, overall diagnostic accuracy of positive peritoneal paracentesis in our study was 93.75%. The study showed that the procedure was 100% accurate in blunt trauma abdomen and gastroduodenal perforation.

In this series of 50 patients, every positive tap revealed evidence of a significant intra-abdominal lesion, which resulted in the early administration of appropriate therapy.

A negative tap did not prove absence of significant intra-abdominal lesion. So it must be considered along with the patients overall clinical and radiological finding.

There was complete absence of complications in our study.

CONCLUSION

In conclusion our study re establishes the simplicity, safety and accuracy of peritoneal tapping as a diagnostic aid in acute abdomen. It is particularly useful in centres where, radiological facilities do not exist, or where radiologists don't available at all time and in serious cases of acute abdomen who cannot be transported for radiography. It is also extremely useful in early diagnosis of complications following abdominal surgery.

It is concluded that diagnostic abdominal tap is extremely reasonable diagnostic aid and can lead to improve surgical care of the patient with atypical acute abdominal pain.

BIBLIOGRAPHY

1. Townsend CM. Sabiston Textbook of Surgery: The biological basis of modern surgical practice 16th Ed. Singapore: Harcourt Asia PTE Ltd., W. B. Saunders Co.; 2001.
2. Thate RL, Jain CS, Nayak N, Dias AD. Diagnostic peritoneal tap of the acute abdomen. Indian J. Surg. 1974; 36: 26-9.
3. Neuhof H, Cohen I. Abdominal puncture in the diagnosis of acute intra peritoneal diseases. Annals of Surgery. 1926; 83:454-62.
4. Giacobine JN, Siler VE. Evaluation of abdominal paracentesis. Surgery Gynec and Obst. 1960; 110: 676-86.
5. Moretz WH, Erickson WG. Peritoneal tap as an aid in the diagnosis of acute abdominal diseases. American Surgeon. 1954; 20: 363-77.
6. Glass WW, Gould SE. The acute abdomen: Aspiration 1st Ed. Baltimore: Williams and Wilkins Company; 1966.
7. Byrne RV. Diagnostic abdominal tap. Surgery Gynecology and Obstetrics. 1956; 103: 362.
8. Stephens FO. The use of peritoneal tap as an aid to diagnosis of intra abdominal lesions. Journal of Royal College of Surgeons, Edinburgh, 1969; 14: 230-4.
9. Gjessing J, Oskarsson BM, Tomlin PJ, Brock-Utne J. Diagnostic abdominal paracentesis. British Medical Journal. 1972; 1: 617-9.
10. McPartlin JF, McCarthy W. An appraisal of diagnostic paracentesis of the abdomen. British Journal of Surgery. 1971; 58(7): 498-501.
11. Strickler JW, Erwin PD, Rice CO. Diagnostic paracentesis. Archives of Surgery. 1958; 77: 859-62.
12. Baker WNW. Mackie DB. Newcombe JF. Diagnostic paracentesis in acute abdomen. British Medical Journal. 1967; 3: 146-9.

13. Prout WC. An Evaluation of Diagnostic paracentesis in acute abdomen. British Journal of Surgery. 1968; 55: 853.
14. Trivedi DR, Shenoy CK, Waghmare AR, Bapat RD, Chaukar AP, Deshmukh SS et al. Diagnostic use of paracentesis periotoneal in the management of acute abdomen. Indian Journal of Surgery. 1971; 33: 3957.
15. Mahanta H, Das MK, Datta Choudhary SB. An experience with diagnostic paracentesis in 100 cases of acute abdomen. Journal of Indian Medical Association, 1990; 88(5): 125-9.
16. Drapanas T, McDonald J. Peritoneal tap in abdominal trauma. Surgery. 1965; 50: 743.
17. Steinberg B. Peritoneal exudate guide diagnosis and prognosis of peritoneal conditions. J.A.M.A.1941; 116: 572.
18. Morris PJ, Wood WC. Oxford textbook of surgery: Acute abdomen. 2nd Ed. New York: Alison Langton; 2000.
19. Greenfield LJ, Mulholland MW, Oldham KT, Zejenock GB, Lillemo KD. Surgery scientific principles and practice: Acute abdomen and Appendix. 13th Ed. Philadelphia: Lippincott Williams and Wilkins; 2001.
20. Bannister LH. Gray's Anatomy: Alimentary System. 38th Ed. New York: ELBS; 1995.
21. Maddaus MA, Ahrenholz D, Simmons RL. The biology of peritonitis and implication for treatment: Surgical Clinics of North America. 1988; 68(2): 431-43.
22. Howard RJ. Current practice of gastrointestinal and abdominal surgery: Acute abdomen. New York: Churchill Livingstone; 1994.
23. Morris PJ, Wood WC. Oxford textbook of surgery: The Peritoneum and Peritonitis. 2nd Ed. New York: Alison Langton; 2000.
24. Ellis BW. Hamilton Bailey's Emergency Surgery: Abdominal Trauma.

th Ed. Bombay; K. M. Verghese Company: 1995.

25. Hai AA. ASI Texbook of Surgery: Abdominal trauma. 1st Ed. New Delhi: Tata McGraw Hill Publishing Company; 2003.
26. Williams RD, Zollinger RH. Diagnostic and prognostic factors in abdominal trauma. American Journal of Surgery. 1959; 97: 575.
27. Khan M, Malik MS, Garyali RK, Dhar PM. Paracentesis peritoneii as a diagnostic aid in acute abdominal emergencies. Indian Journal of surgery.
; 37: 29-35.
28. Lamke LO, Varenhorst E. Abdominal paracentesis for early diagnosis of closed abdominal injury. Acta. Chir. Scand. 1978; 144(1): 21-5.
29. Sloop RD. The dominant role of paracentesis technics in the early diagnosis of blunt abdominal trauma. American Journal of Surgery. 1978; 136(1): 145-50.
30. Narasinga RT, Naik BB. Results of diagnostic peritoneal tap in acute abdomen. Indian Journal of Surgery. 1993; 55(7): 338-40.
31. Singh J, Bharadwaj DN, Singh B. Paracentesis in the management of
Acute Abdomen. Journal of Indian Medical Association. 1973; 61(4): 176-9.
32. Bhatnagar VB, Asopa HS. Diagnostic abdominal paracentesis. Journal of Indian Medical Association, 1971; 57: 167.
33. Kosloske M, Goldthorn JF. Paracentesis as an aid to the diagnosis of intestinal gangrene. Experience in 50 infants and children. Archives of Surgery. 1982; 117(5): 571-5.
34. Mansoor T, Zubari S, Masiullah. Evaluation of peritoneal lavage and abdominal paracentesis in cases of blunt abdominal trauma. Journal of Indian Medical Association. 2000; 98(4):174-5.
35. Rao SPS, Parekh BR, Raina VK, Kapoor JP. Evalaution of Diagnostic abdominal paracentesis in acute surgical conditions of the abdomen.

REFERENCES

1. Thate RL, Jain CS, Nayak N, Dias AD. Diagnostic peritoneal tap of the acute abdomen. Indian J. Surg. 1974; 36: 26-9.
2. Neuhof H, Cohen I. Abdominal puncture in the diagnosis of acute intra peritoneal diseases. Annals of Surgery. 1926; 83:454-62.
3. Giacobine JN, Siler VE. Evaluation of abdominal paracentesis. Surgery Gynec and Obst. 1960; 110: 676-86.
4. Moretz WH, Erickson WG. Peritoneal tap as an aid in the diagnosis of acute abdominal diseases. American Surgeon. 1954; 20: 363-77.
5. Gjessing J, Oskarsson BM, Tomlin PJ, Brock-Utne J. Diagnostic abdominal paracentesis. British Medical Journal. 1972; 1: 617-9.

ANNEXURE I

PROFORMA OF CLINICAL EXAMINATION OF

INDIVIDUAL PATIENT

Serial No.	
Name of the Patient :	
Age :	
Sex :	
Address :	
Occupation :	
Socioeconomic status :	
IP No.	
DOA :	
Clinical Diagnosis :	
Clinical Details :	

Abdominal pain Traumatic or Non traumatic Site Mode of onset Shifting of pain Radiation of pain Referred pain Character of pain Aggravating or relieving factors	
Abdominal Distention	
Vomiting	
Bowel habits (Constipation / Diarrhoea)	
Person history	
Past history	
Drug history	
General physical examination Vitals Appearance Attitude	

P/A Abdomen Inspection Palpation Percussion Auscultation	
RS Examination	
CVS Examination	
General Examination	
Investigations CBC RFT LFT Urine routine X-ray abdomen - Erect - Lateral decubitus USG abdomen	
CT Scan abdomen	

Peritoneal tap Clear Turbid Bile Hemorrhagic Purulent Others	
Peritoneal Cytology	
Preoperative diagnosis by peritoneal tap	
Type of operation Findings during operation	
Type of Anaesthesia	
Post-operative diagnosis	
Summary :	

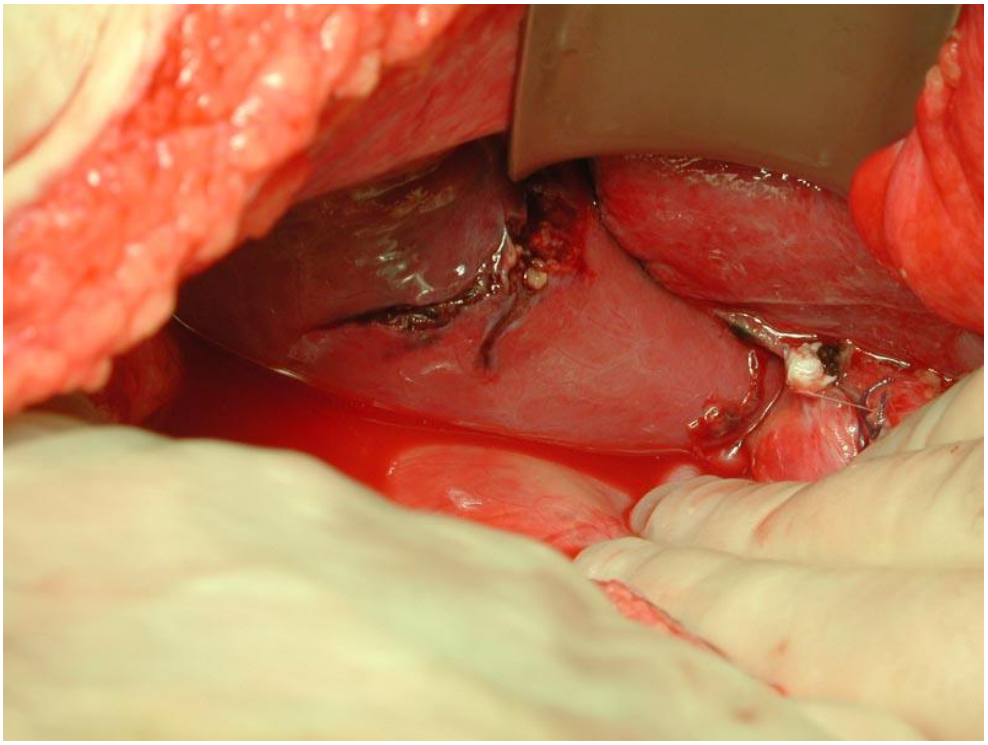
ANNEXURE III – KEY TO MASTER CHART

Y	-	yes
N	-	No
M	-	Male
F	-	Female
AP	-	Appendicular perforation
BTA	-	Blunt trauma abdomen
DP	-	Diffuse peritonitis
LP	-	Localized peritonitis
PAN	-	Pancreatitis
PP	-	Perforative peritonitis
B	-	Bilious
BL SF	-	Blood stained fluid
BSF	-	Bile stained fluid
CL	-	Clear fluid
PL	-	Purulent fluid
H	-	Haemorrhagic
FL	-	Feculent
SS	-	Sero sanguinous
P	-	Positive
N	-	Negative
T	-	Turbid fluid
OL	-	Odourless
U	-	Uriniferous

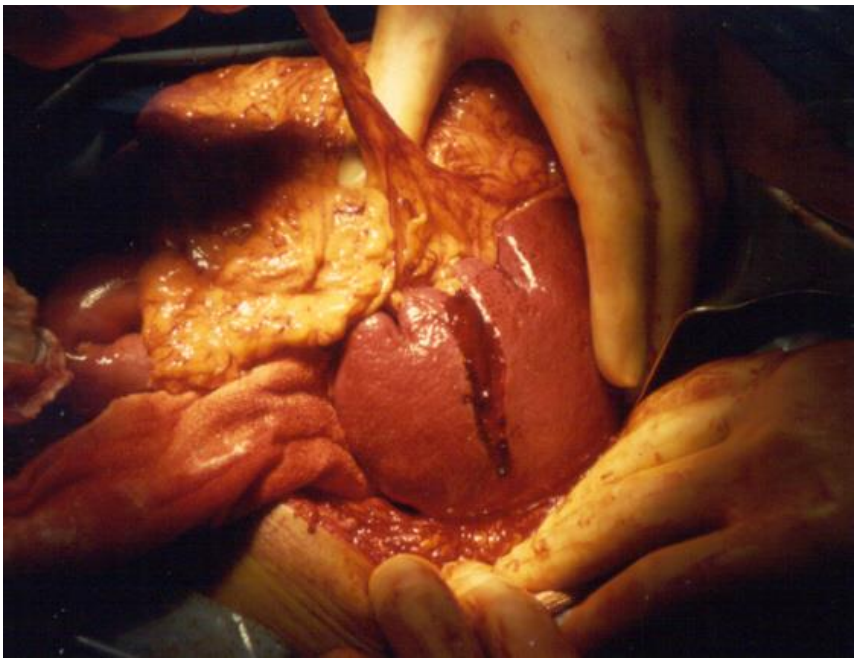
AUD	-	Air under diaphragm
GGA	-	Ground glass appearance
LI	-	Localized ileus
NAUD	-	No air under diaphragm
NAD	-	No abnormality detected
FF	-	Free fluid
MDA	-	Moderate degree ascites
ND	-	Not done
IP	-	Ileal Perforation
JP	-	Jejunal Perforation
LL	-	Liver Laceration
DP	-	Duodenal perforation
GP	-	Gastric perforation
GBP	-	Gall bladder perforation
IIK	-	Ileo ileal knotting
INT	-	Intussuception
MD	-	Meckel s diverticulitis
MI	-	Mesenteric ischemia
MT	-	Mesenteric tear
PAL	-	Post anastomotic leak
RB	-	Rupture bladder
RPH	-	Retro peritoneal haematoma
RLA	-	Ruptured liver abscess
RSA	-	Ruptured splenic abscess

SL	-	Splenic laceration
SP	-	Sigmoid perforation
APP	-	Appendicectomy
BR	-	Bladder repair
CHY	-	Cholecystectomy
CONS	-	Conservative
GJ	-	Gastro jejunostomy
HR	-	Hepatorraphy
HP	-	Hemoperitoneum
Ile	-	Ileostomy
OMC	-	Omental patch closure
PL + D	-	Peritoneal lavage, drainage
PR	-	Primary repair
SAL	-	Salphingectomy
R + A	-	Resection and anastomosis
SR	-	Splenorraphy
ST	-	splenectomy

TRAUMATIC ACUTE ABDOMEN

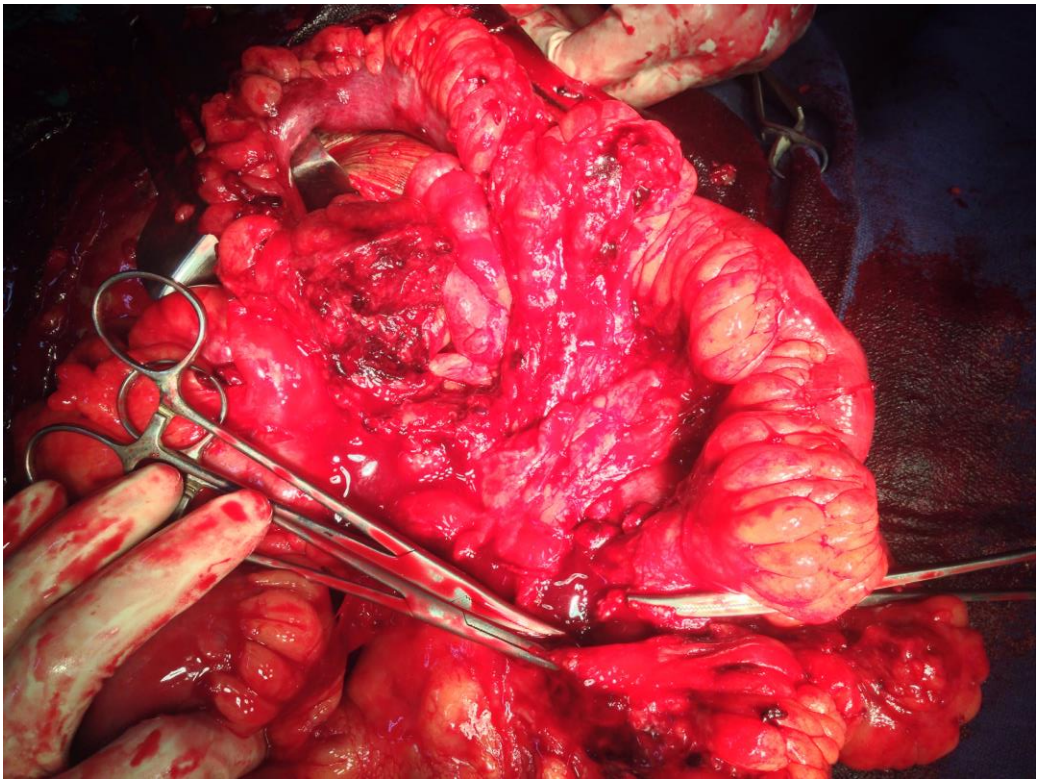


Liver laceration with Hemoperitoneum on laparotomy

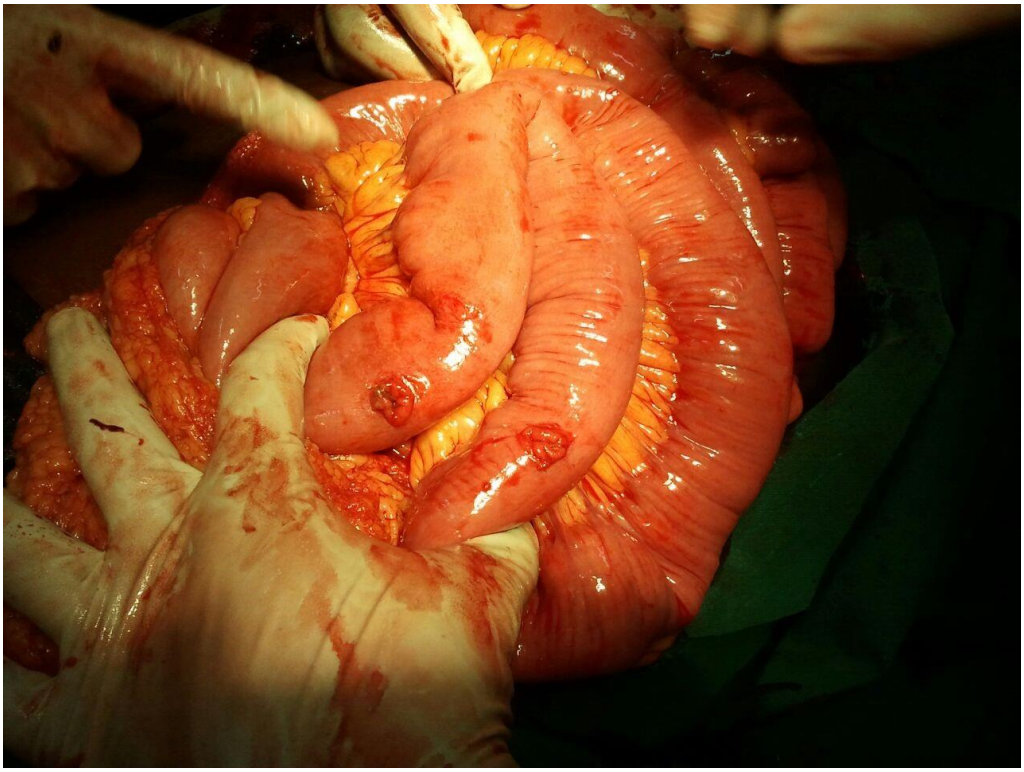


Traumatic Splenic laceration

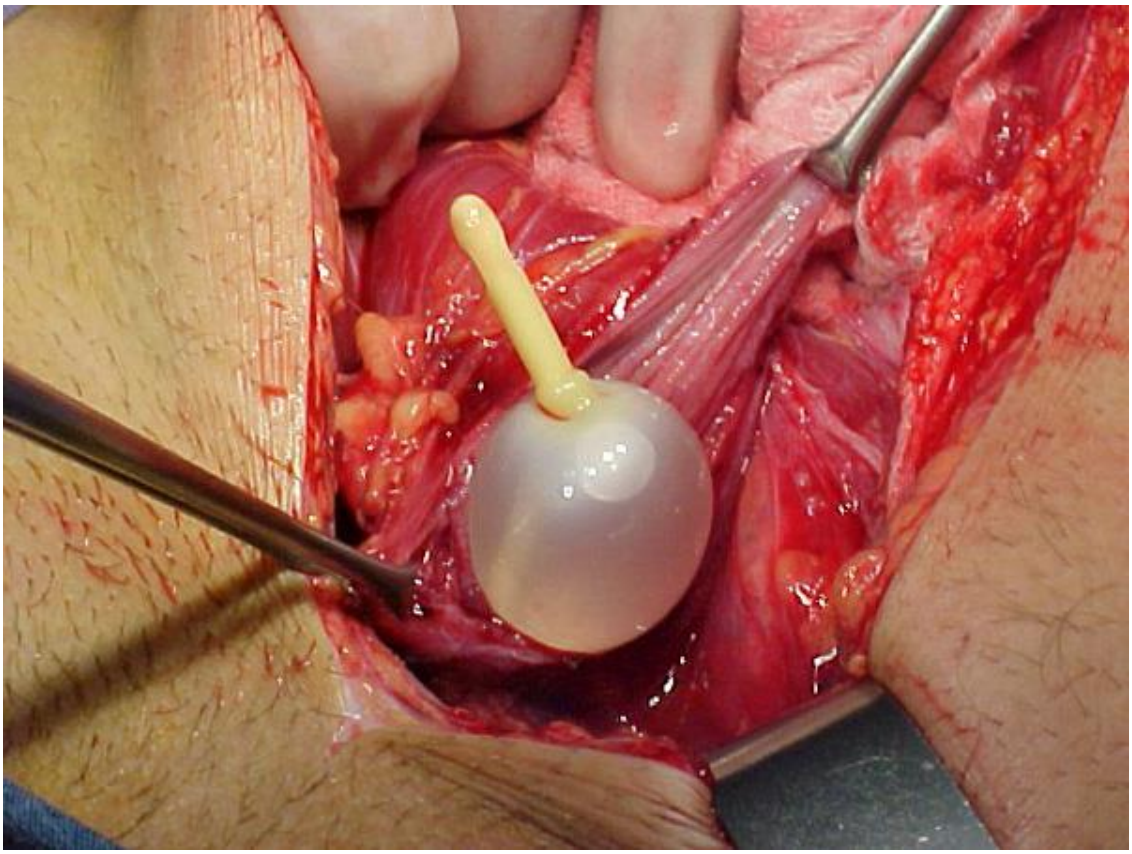
Traumatic small bowel injury



Traumatic mesenteric tear with Hemoperitoneum

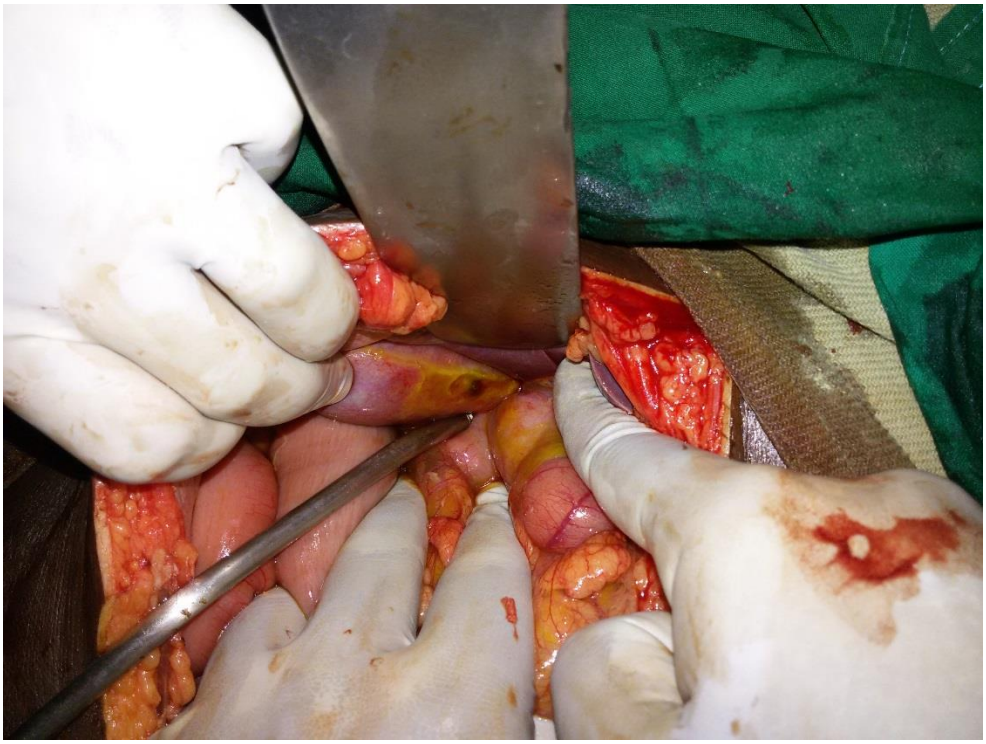


Traumatic ileal perforation

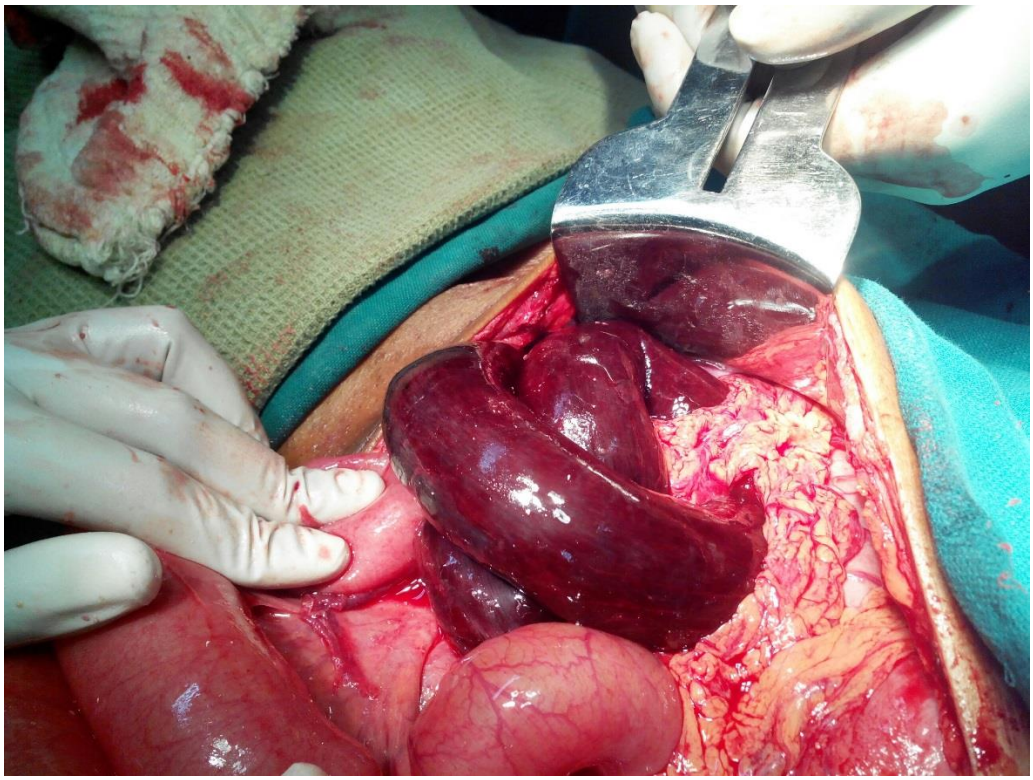


Rupture urinary Bladder

NON TRAUMATIC ACUTE ABDOMEN



Gall bladder perforation



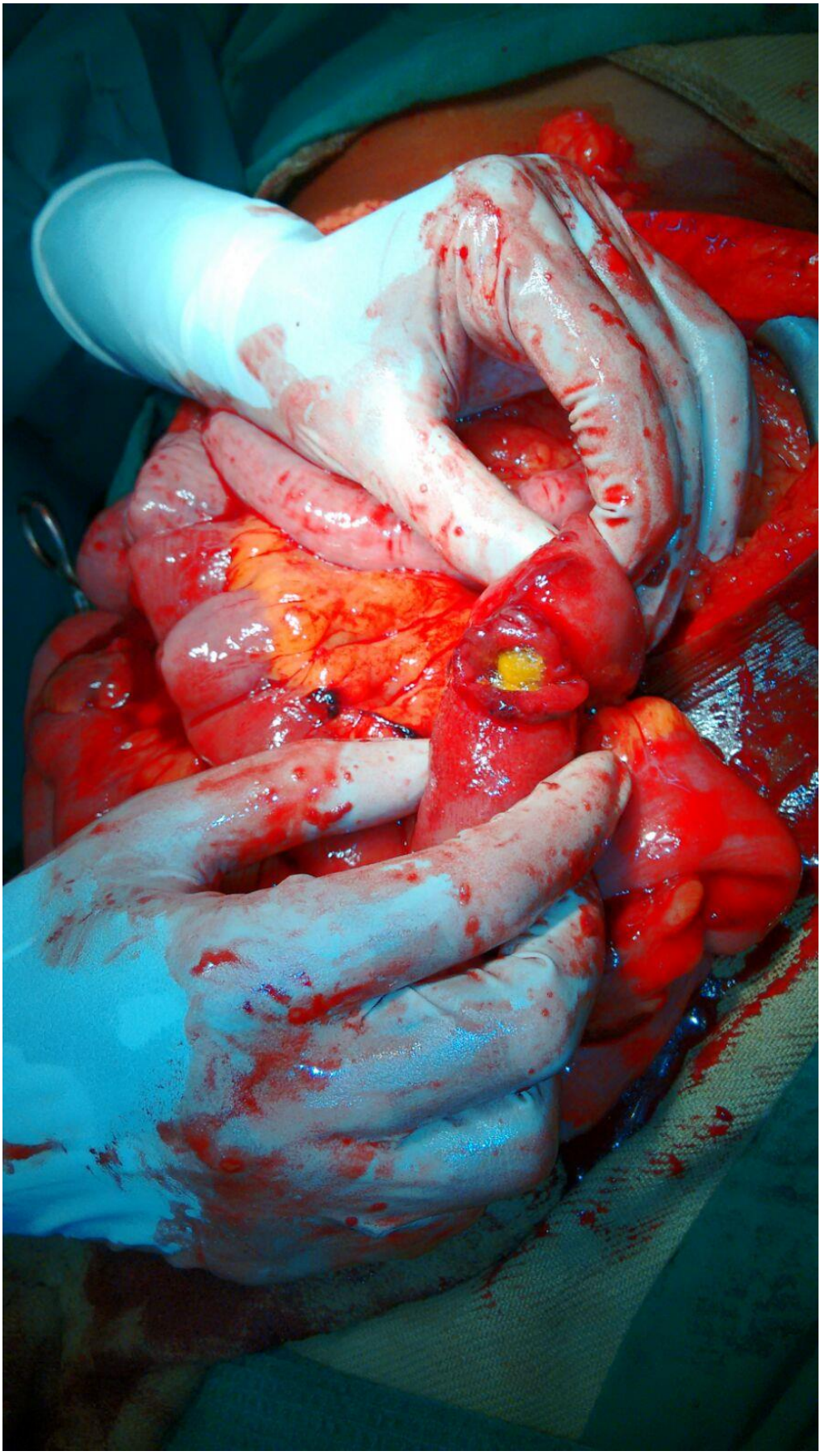
Strangulated small bowel

Gastric perforation

Appendicular perforation

Ruptured ectopic pregnancy with Hemoperitoneum

Duodenal perforation



Small Bowel perforation

S.No.	IP No.	Age	Sex	Pain	Vomiting	Distension	Constipation	Tenderness	Guarding	Rigidity	Absent Bowel Sounds	Liver Dullness Obliteration	Tachycardia(>100/mt)	Hypotension(Sys<90mmHg)	Clinical Diagnosis	Gross Nature of Tap	Odour of Tap	Microscopic Finding of Tap	X Ray Abd Erect	USG Abdomen	CT Abdomen	Intra Op findings	Procedures
1	34576	26	F	Y	Y	Y	Y	Y	N	Y	Y	N	N	N	PP	PL	PL	P	LI	FF	NAD	IP	R+A
2	35697	34	M	Y	N	N	N	Y	Y	Y	N	N	Y	N	BTA	H	OL	P	NAD	FF+ SL	ND	SL	SR
3	33985	27	M	Y	N	N	N	Y	Y	N	N	N	Y	Y	BTA	H	OL	P	NAD	FF	ND	LL + HP	HR
4	35890	44	M	Y	Y	Y	Y	Y	N	Y	N	Y	Y	Y	PP	B	OL	P	AUD	ND	ND	GP	OMC
5	39876	51	M	Y	Y	N	N	Y	N	N	Y	N	Y	N	DP	PL	PL	P	NAD	FF	ND	RLA	PL+D
6	39976	36	M	Y	N	N	N	Y	N	Y	Y	N	Y	Y	BTA	H	OL	P	NAD	FF+LL	ND	LL	HR
7	40234	28	M	Y	Y	Y	Y	Y	N	N	Y	N	Y	N	DP	N	N	N	GGA	NAD	ND	MD	R+A
8	40896	65	M	Y	Y	Y	N	Y	Y	N	Y	Y	Y	N	PP	B	OL	P	AUD	ND	ND	GP	OMC
9	41234	42	F	Y	N	N	N	Y	N	Y	Y	N	Y	N	BTA	H	OL	P	NAD	NAD	ND	MT + HP	PR
10	42346	16	M	Y	Y	N	N	Y	Y	N	Y	N	Y	N	AP	T	OL	P	LI	FF	ND	AP	APP
11	42891	54	M	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	N	PP	PL	OL	P	AUD	ND	ND	DP	OMC
12	42790	29	M	Y	N	N	N	Y	Y	Y	Y	N	Y	N	BTA	BSF	OL	P	NAD	FF	ND	JP	PR
13	43345	39	M	Y	Y	N	N	Y	N	Y	N	N	Y	N	DP	PL	PL	P	NAD	FF	ND	RSA	PL+D
14	43456	47	M	Y	Y	N	Y	Y	N	Y	Y	N	Y	N	DP	BL SF	OL	P	NAD	NAD	NAD	IIK	R+A
15	43893	22	M	Y	N	N	Y	Y	Y	N	Y	N	N	N	AP	PL	PL	P	NAD	AP	ND	AP	APP
16	44001	17	F	Y	N	N	N	Y	Y	Y	N	N	Y	N	AP	PL	PL	P	LI	AP	ND	AP	APP
17	44120	21	F	Y	N	N	N	Y	N	N	N	N	Y	N	BTA	CL	U	P	NAD	FF	RB + MD	RB	BR
18	44357	42	M	Y	Y	Y	Y	Y	N	Y	Y	N	Y	N	PP	B	OL	P	AUD	ND	ND	DP	OMC
19	44876	33	F	Y	N	Y	Y	Y	N	N	Y	N	Y	N	PP	N	N	N	LI	FF	ND	IP	R+A
20	44906	14	M	Y	Y	N	N	Y	Y	N	Y	N	Y	N	AP	FL	FL	P	LI	AP	ND	AP	APP
21	45012	48	M	Y	Y	Y	N	Y	Y	Y	Y	N	Y	Y	DP	T	OL	P	NAD	AC	ND	CONS	CONS
22	45045	15	M	Y	N	N	N	Y	N	Y	Y	N	Y	N	AP	PL	PL	P	LI	AP	ND	AP	APP
23	45297	34	F	Y	N	N	N	Y	N	N	Y	N	Y	N	DP	N	N	N	GGA	NAD	ND	INT	R+A

24	45290	45	M	Y	Y	N	N	Y	Y	Y	N	N	Y	N	PAN	B	OL	P	GGA	FF	ND	GBP	CHY
25	45367	28	M	Y	N	N	N	Y	N	Y	N	N	Y	Y	BTA	H	OL	P	NAD	FF+SL	ND	SL +HP	ST
26	45491	24	M	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	PP	B	OL	P	AUD	FF	ND	IP	R+A
27	45672	58	M	Y	Y	N	N	Y	Y	Y	N	Y	Y	N	PP	B	OL	P	NAUD	FF	ND	GP	OMC
28	45763	29	M	Y	Y	Y	Y	Y	N	Y	Y	N	Y	N	PP	PL	OL	P	AUD	ND	ND	DP	OMC
29	45832	37	M	Y	N	N	N	Y	Y	Y	N	N	N	N	BTA	H	OL	P	NAD	FF	ND	LL + HP	HR
30	45901	27	M	Y	N	Y	Y	Y	N	Y	Y	N	Y	N	DP	BL SF	OL	P	GGA	NAD	MDA	MI	R+A
31	46111	39	F	Y	Y	Y	Y	Y	N	Y	N	N	Y	N	PP	B	OL	P	AUD	ND	ND	DP	OMC
32	46324	59	M	Y	N	Y	N	Y	N	N	N	N	Y	N	BTA	BSF	OL	P	NAD	FF	ND	JP	PR
33	46589	28	F	Y	N	Y	N	Y	N	N	Y	N	Y	Y	LP	H	OL	P	LI	FF	ND	RE + HP	SAL
34	46790	53	M	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	PP	B	OL	P	AUD	ND	ND	DP	OMC
35	46949	22	M	Y	N	N	N	Y	N	N	N	N	Y	Y	BTA	H	OL	P	NAD	FF+SL	ND	SL +HP	SR
36	47035	46	M	Y	Y	Y	N	Y	Y	Y	N	N	N	N	PP	SS	OL	P	NAUD	FF	ND	IP	R+A
37	47243	24	M	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	PP	B	OL	P	AUD	FF	ND	IP	R+A
38	47771	44	M	Y	N	N	N	Y	Y	N	Y	N	Y	N	BTA	H	OL	P	NAD	NAD	ND	MT + HP	PR
39	47925	68	M	Y	N	Y	N	Y	N	N	N	N	N	N	DP	B	OL	P	NAD	FF	MDA	PAL	ILE
40	47909	36	M	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	PP	B	OL	P	AUD	ND	ND	DP	OMC
41	48923	25	M	Y	N	N	N	Y	N	N	N	N	Y	N	BTA	H	OL	P	NAD	FF	ND	LL + HP	HR
42	48942	34	F	Y	Y	Y	N	Y	Y	N	N	N	Y	Y	PP	PL	OL	P	NAUD	FF	ND	IP	R+A
43	49921	29	M	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	N	PP	B	OL	P	AUD	ND	ND	GP	OMC
44	50102	57	M	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	N	PP	B	OL	P	AUD	ND	ND	GP	GJ
45	50221	25	M	Y	N	N	N	Y	N	N	N	N	N	N	BTA	FL	FL	P	NAD	NAD	NAD	SP	PR
46	50455	49	M	Y	N	Y	Y	Y	N	Y	N	Y	Y	N	PP	PL	OL	P	NAUD	FF	ND	DP	OMC
47	50567	51	M	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	PP	B	OL	P	NAUD	FF	ND	DP	OMC
48	50789	30	F	Y	N	N	N	Y	Y	N	Y	N	Y	Y	BTA	N	N	N	NAD	NAD	RPH	CONS	CONS
49	51239	59	M	Y	Y	Y	Y	Y	N	N	Y	Y	Y	N	PP	PL	OL	P	AUD	ND	ND	GP	GJ
50	52274	32	F	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	PP	B	OL	P	AUD	ND	ND	DP	OMC